GIKURIRO Program - The Integrated Nutrition and WASH Activity

Baseline Survey Report

March, 2017

Table of Contents

List of Tables

List of Figures

Acknowledgments

The consultant team would like to express their deepest gratitude for the efforts of a number of organizations and individuals who contributed to the success of this baseline survey of the *Gikuriro* program.

First, we would like to acknowledge the financial assistance provided by the United States Agency for International Development (USAID) for CRS–SNV Rwanda's Integrated Nutrition and WASH Activity: *Gikuriro* program.

We express our thanks to the Ministry of Health, from the central to decentralized levels, for their close collaboration and assistance throughout the preparation and implementation of this survey. We gratefully acknowledge the guidance received from the Maternal, Child, and Community Health Division, Environmental Health Desk, and National Health Research Committee.

We would, hereby, like to acknowledge the Ministry of Local Government, specifically the local authorities, for their assistance and contribution to the smooth implementation of this survey.

We would like to acknowledge the role of SNV and CRS technical team in backstopping this evaluation and providing guidance not only with district staff but also at Community level. We want also to thank the community health workers for providing the sampling frames and their time and guidance during household selection and field work.

We thank all caregiver, mothers and fathers who devoted their time and sat down with the enumerators to answer all the survey questions.

We wish to thank the enumerators and nutrition students from the University of Rwanda School of Public Health for their excellent work and commitment to the survey and for agreeing to walk long distances to reach remote households and working long hours with energy and enthusiasm. Finally, we would like to appreciate the support provided by the management of University of Rwanda College of Medicine and Health Sciences /School of Public Health which enabled the research team to undertake this survey.

Research Team

Mr. Didier GAGA RUKORERA, Bachelor degree in Statistics, MPH student (Statistician)

Jean Paul KIMENYI, MD, MSc (Research Assistant)

Mr. Albert NDAGIJIMANA, MPH (Co-investigator)

Mr. Joseph KATABARWA, MCHD (WASH Specialist)

Bernard NGABO RWABUFIGIRI, MD, MPH (Co-investigator)

Assumpta MUKABUTERA, MPH, PhD (Co-investigator)

Prof. Cyprien MUNYANSHONGORE, MSc, PhD (Principal Investigator)

Acronyms and Abbreviations

AEE:	African Evangelistic Enterprise
ANC:	Antenatal care
ASM:	Agent de Santé Maternelle
CFSVA:	Comprehensive Food Security and Vulnerability Analysis
CHC:	Community Health Club
CHW:	Community Health Worker
CRS:	Catholic Relief Service
CSI:	Coping Strategies Index
DPEM:	District Plan to Eliminate Malnutrition
EICV:	Enquête Intégré sur les Conditions de Vie des ménages
FCS:	Food Consumption Survey
FGD:	Focus Group Discussion
FXB:	François-Xavier Bagnoud
HC:	Health Center
INWA:	Integrated Nutrition and WASH Activity
KII:	Key Informant Interview
MDD:	Minimum Dietary Diversity
MoH:	Ministry of Health
NISR:	National Institute of Statistics of Rwanda
P&G:	Procter & Gamble
RDHS:	Rwanda Demographic and Health Survey
RHF:	Recommended Home Fluid
SACCO:	Savings and Credit Cooperative Organization
SILC:	Savings and Internal Lending Communities
SNV:	Stichting Nederlandse Vrijwilligers (Netherlands Development Organization)
UNICEF:	United Nations Children's Fund
USAID:	United States Agency for International Development
WASH:	Water, Sanitation, and Hygiene
WDDS:	Women's Dietary Diversity Score
WHO:	World Health Organization

1 EXECUTIVE SUMMARY

Background

Rwanda has made advances in recent years in terms of health care. It is one of the countries that have achieved most of the Millennium Development Goals, and has done particularly well in reducing the number of people living in poverty(1)(2). In spite of these positive developments, food insecurity and childhood stunting continue to pose a challenge to many households. The Ministry of Health together with its development partners is putting a lot of effort into finding solutions to these problems through national policies and strategies. It is in this context that a consortium of two international agencies—Catholic Relief Services and SNV, the Netherlands Development Organization—will implement a USAID funded Integrated Nutrition and Water, Sanitation, and Hygiene (WASH) Activity (INWA) which has been renamed in Kinyarwanda as Gikuriro *(meaning "good growth as opposed to stunting").* The *Gikuriro* program will be implemented through decentralized Government of Rwanda systems and structures and local civil society organizations in eight Rwandan districts. The *Gikuriro* program will focus on capacity building as well as nutrition and WASH-service delivery with the purpose of improving the nutritional status of women of reproductive age and children aged under 5 years, especially, in the first 1000 days of life

Objectives

The purpose of this survey was to conduct a baseline evaluation for the *Gikuriro* program to define baseline indicators. These results will form an information base against which to monitor and assess the progress and effectiveness of the *Gikuriro* program during the implementation stage and after the program is completed in November 2020. Information were collected on (i) socioeconomic and demographic status,(ii) women's and children's access to food and diet,(iii) infant and young child feeding practices,(iv) primary care services to children and women, and antenatal-care services, (v) nutrition interventions,(vi) households' knowledge, attitudes, and practices related to key WASH issues,(vii) access to improved sanitation facilities, and (viii) access to safe drinking water and drinking water treatment and storage.

Methods

Quantitative assessment methods were used for the household survey. The National Institute of Statistics of Rwanda provided the national master sample which was selected using Probability Proportional to Size. To get the sample selection of our study, the master sample was used. A cross-sectional study design with representative multi-stage sampling survey was employed where two stages with Primary Units were selected using Simple Random Sampling and Secondary Units were selected with Systematic Random Sampling. The survey was conducted at the community

level in the intervention area of the *Gikuriro* program, which targeted six districts out of the eight covered, namely, Ngoma, Kicukiro, Nyarugenge, Nyabihu, Kayonza, and Rwamagana. The other two, Ruhango and Nyanza, had baseline conducted by partners. In each district, the study unit was selected using a stratified two-stage cluster sampling method. Within each district, 18 villages were selected using a simple random sampling approach, and then, 24 households per village were selected using a systematic random sampling approach. One interview was conducted per household, and the total number of household members was recorded. In total, 2525 representative households were visited for the survey. Final-year students from the Department of Human Nutrition and Dietetics, University of Rwanda, were hired to collect data using electronic tablets, using SurveyCTO server. SurveyCTO is a product that helps to capture, transport, and process data collected during personal interviews, based on the Open Data Kit. The quantitative data were complemented by triangulation with qualitative data, which were mainly obtained via focus group discussions (FGDs), Key Informant Interviews (KIIs) and observation. A total of 24 FGDs with focus groups consisting of community health workers (CHWs; Binome and ASM (Agent de Santé Maternelle), female heads of households, male heads of households, village in charge of social affairs at village level (ASOCs), and community health club (CHC) representatives were conducted. For the KIIs, district administrative staff (Director of Health, District Hygiene and Sanitation Officer), district hospital staff (hospital nutritionist, Community Health Workers (CHW) supervisor, Hospital Environmental Health Officer), health center staff (hospital nutritionist, CHW supervisor, Hospital Environmental Health Officer), and local implementing partners (nutrition and WASH) were interviewed. Qualitative data were analyzed using Atlas.ti, while STATA v13 was used to perform quantitative analysis.

Results

The following are the key findings of the baseline survey of 2517 households in the six districts of the *Gikuriro* intervention area:

- **The family size of households in the *Gikuriro* intervention area was large, and a considerable proportion of households were headed by females.** Almost half the households (48.3%) had six or more members, and one in three (28.3%) was headed by a woman. Almost half the households were in Ubudehe categories 1 or 2 (49.6%), and this percentage was particularly high in Nyabihu (63%) and Ngoma (64%).
- **The study shows that three in five (66%) households owned a mobile phone, which was the most common household asset.** The information and communication technologies sector has been regarded as a key element in Rwanda's development process.
- **The majority of households (69.2%) experienced stress due to lack of food or money to buy food in the 30 days preceding the survey.** The district with the largest proportion of households that experienced this type of stress was Nyabihu, which is located in Western Province, where 85.5% (361/422) of all households reported experiencing stress due to lack of food or money to buy food in the 30 days preceding

the survey. The most commonly used coping strategy was "relying on less-preferred and less-expensive foods" (83.9%), followed by "reducing the number of meals eaten a day" (69.1%), which was practiced two or more times a week. Kicukiro was the most food-secure district, with an average coping strategies index (CSI) score of 19.9 (SD=14.6), while Nyabihu was the most food-insecure district, with an average CSI score of 33.1 (SD=26.2).

- **Most foods consumed in households were sourced from the market, and only 781(31%) households owned a kitchen garden.**
- **Nearly half of all women consumed a diet with poor nutritional quality.** The findings show that 46% of women had low dietary diversity (≤3 food groups), 37% had medium dietary diversity (4 or 5 food groups), and 17% had high dietary diversity (≥6 food groups). The average Women's Dietary Diversity Score (WDDS) was 3.8. The Kigali-City districts had the highest WDDS (Kicukiro, 4.9; Nyarugenge, 4.3), while the Eastern Province districts had the lowest WDDSs (Kayonza, 3.2; Ngoma, 3.3).
- **Household food security was a key issue in *Gikuriro* districts.** Results show that 60% of households had poor food consumption (severely food insecure), 18%had borderline food consumption (moderately food insecure), and 22%had acceptable food consumption (food secure). The highest proportion of households with poor food consumption was found in Nyabihu (69%).
- **Biological mothers or other caregivers' knowledge on infant and young child feeding was still poor.** It was observed that 12% of biological mothers or other caregivers did not know the recommended length of exclusive breastfeeding, and only 45.2% were aware of adequate complementary feeding.
- **Media were key channels for nutrition education.** Listening to the radio and having information on breastfeeding and complementary feeding were found to be associated with providing the minimum dietary diversity to children ($p<0.001$). Children in families who ever received nutrition support were almost twice as likely to eat diverse food groups as children in families that did not received nutrition support.
- **Infant and young child feeding practices in the surveyed community were relatively poor.** One in three (29%) children aged 6–23 months have the minimum dietary diversity (four or more food groups). Only 9% of children aged 9–23 months received the minimum meal frequency, and only 6.1% of children aged 9–23 months met the requirements for a minimum acceptable diet based on dietary diversity and meal frequency. Consumption of protein-rich food was very low (10.2%–25.3%). Almost one in five children aged under 6 months (14.4%) was not exclusively breastfed.
- **Operation of CHCs was dormant.** Only 831 (33%) respondents were aware of the existence of CHCs, and only 116 (14%) had participated in dialogue sessions at a CHC.
- **Poor personal hygiene was prevalent.** The survey showed that 18% of respondents had not washed their hands with soap and water in the 24 hours preceding the survey. Only 1.8% of caregivers washed their hands before preparing food, while only 0.8% washed their hands after handling children's feces or cleaning children's bottoms. Only

127 (6.2%) respondents washed their hands before eating, and 21(1%) washed their hands before feeding or breastfeeding their children.

- **Access to improved sanitation facilities was an issue.** Of 2054 households, 518 (25.2%) had a handwashing station within 5 m from the toilet, while 336 (16%) had soap and water at a handwashing station commonly used by the family members. It was found that 333 (13.2%) children aged under 3 years defecated anywhere on the ground. The stools of 90%of children aged under 3 years were safely disposed, which means that the children used a toilet/latrine or their feces were put/rinsed in a toilet/latrine or buried. Only 52% of households had an improved, unshared sanitation facility.
- **Water treatment and storage must be improved.** We found that 1401 (56%) households properly treated drinking water by using methods such as boiling 1265(90.3%), chemical purification 55 (3.9%), and ceramic and sand filters 48 (3.4%) and 1494 (59%) properly stored drinking water.
- **Diarrhea prevalence was comparable across districts.** In the 2 weeks preceding the survey,360 (22%) children aged under 5 years had had diarrhea(Nyarugenge, 19.4%;Kicukiro, 17.9%;Nyabihu, 33.2%;Rwamagana, 23%;Kayonza, 22.8%;Ngoma, 18.4%). Of these children, only 50% had been given oral rehydration solution.
- **Coverage of community nutrition interventions was low.** In all, 43.5% of respondents reported having a nutrition education and counseling program in their village, and 27.4% had attended a session in the month preceding the survey.
- **Preventive health services for children were strong.** We found that 1344(86%) children aged less than 5 years had received vitamin A, and 1277(81%) had received deworming tablets in the 6 months preceding the survey. Only 8% of children aged under 5 years had not received any vaccination to prevent diseases.
- **Utilization of antenatal-care services must be improved.** Only 44.1% of mothers had attended four or more antenatal consultations during their last pregnancy, and only 80 (34.3%) women had made their first visit before the fourth month of pregnancy. Most women 761 (78.7%) had attended at least three antenatal visits with their husbands.

Conclusion

According to the *Gikuriro* baseline survey, insufficient food production and access pose public-health problems. Most households (69.2%) experienced stress due to lack of food or money to buy food in the 30 days preceding the survey. Additionally, 60% of households had poor food consumption (severely food insecure), and the majority of food consumed in households was sourced from the market. Only 781 (31%) households owned a kitchen garden. Nearly half of all women consumed a diet with poor nutritional quality; 46% of women had low dietary diversity (≤3 food groups).

Biological mothers or other caregivers' knowledge on infant and young child feeding was still poor, and infant and young child feeding practices were relatively poor in the surveyed community. One in three (29%) children aged 6–23 months met the requirements for the minimum dietary diversity (four or more food groups). Only 9% of children aged 9–23 months received the minimum meal frequency, and only 6.1% met the requirements for a minimum acceptable diet based on dietary diversity and meal frequency.

Indicators of households' knowledge, attitudes, and practices on key hygiene, sanitation, and water issues were still poor. We found that **poor personal hygiene was prevalent**; 18% of respondents had not washed their hands with soap and water in the 24 hours preceding the survey. **Access to improved sanitation facilities was an issue**; of 2054 households, 518 (25.2%) had a handwashing station within 5 m from the toilet, while 336 (16%) had soap and water at a handwashing station commonly used by the family members. **Water treatment and storage must be improved**; 1401 (56%) households properly treated their drinking water, and 1494 (59%) properly stored their drinking water. **Diarrhea prevalence was high**; 360 (22%) children aged under 5 years had had diarrhea in the 2 weeks preceding the survey. **The proper utilization of antenatal-care services must be encouraged.** Only 44.1% of mothers had attended four or more antenatal consultations during their last pregnancy, and only 80 (34.3%) women had made their first antenatal visit before the fourth month of pregnancy.

Recommendations

- Educate women and other caregivers about infant and young child feeding with a big emphasis on follow-up to check that the knowledge is translated into attitude and behavior changes.

- Educate the population on better child nutrition, and encourage the consumption of a higher diversity of food items and a higher frequency of meals.

- Support vulnerable population in the availability and accessibility of key food items required for proper child nutrition, by reinforcing and improving household purchasing capacity and improving agricultural production.

- Increase the nutritional content of food items consumed, through nutrition education and increased accessibility of nutrient-rich food, especially, protein- and iron-rich food, by providing families with small livestock such as poultry and rabbits.

- Motivate CHC members to be active in the community. Refine the CHC job description and monitoring system.

- Support households to install a hand-washing station near the toilet and equip it with soap and clean water.

- Educate the population about crucial hand-washing times and the importance of hand washing at each of these times; increase their capacity to get soap and water.

- Educate communities about the importance of the proper treatment of drinking water.

- Motivate pregnant women to access antenatal-care services before the fourth month of pregnancy and strengthen the mobilization of male involvement

2 INTRODUCTION

2.1 Childhood Stunting

2.1.1 Overview

Childhood stunting is one of the most significant obstacles to human development. Stunting, or being too short for one's age, is defined as a height for age that is more than two standard deviations below the median height for one's age according to the World Health Organization (WHO) Child Growth Standards (3). In 2015, 23.2%, or just under one in four, children under the age of 5 years were affected by growth stunting worldwide. Between 1990 and 2015, the global childhood stunting prevalence declined from 39.6% to 23.2%, and the number of children affected fell from 255 million to 156 million (4). In 2015, just two out of every four stunted children lived in South Asia, and one in three lived in sub-Saharan Africa (4). However, during the same time, the number of children with stunted growth in West and Central Africa increased at an alarming rate–from 19.9 million to 28.3 million (5). At present, the prevalence of childhood stunting ranges from 5% to 65% among the less-developed countries (5).

2.1.2 Causes of childhood stunting

Factors associated with childhood stunting include poor maternal health and nutrition, inadequate infant and young child feeding practices, and infection during the first 1000 days of life from pregnancy to the child's second birthday. Specifically, the maternal nutritional and health status before, during, and after pregnancy influences the child's early growth and development, beginning in the womb (6). Other maternal contributors to stunting include short stature, short birth spacing, and adolescent pregnancy (which interferes with nutrient availability to the fetus owing to the competing demands of ongoing maternal growth). Infant and young child feeding practices associated with growth stunting include non-exclusive breastfeeding and complementary feeding that is limited in quantity, quality, and variety. Severe infections during the first 1000 days of life can result in wasting, which has long-term consequences for linear growth. Some subclinical infections, which result from exposure to contaminated environments and poor hygiene, can also lead to stunting, as they lower nutrient absorption and reduce the ability of the gut to function as a barrier against disease-causing organisms (7). Furthermore, household poverty, caregiver neglect, nonresponsive feeding practices, inadequate child stimulation, and food insecurity can all interact to impede growth and development.

Stunting has long-term effects on individuals and societies. Stunting before the age of 2 years can predict poor cognitive and educational outcomes in later childhood and adolescence (7) and has economic consequences at the individual, household, and community levels(8).

2.1.3 Childhood stunting in Rwanda

The prevalence of chronic malnutrition or stunting among children under the age of 5 years remains persistently high in Rwanda. According to the Rwandan Demographic and Health Survey (RDHS, 2014–2015), stunting, which results in delayed growth, affects 38% of children under the age of 5 years (2). This reflects a failure to receive adequate nutrition over a long period. The survey also showed that the disparity in stunting prevalence between rural and urban children is significant: 40.6%among rural children as compared with 23.7%among urban children. Additionally, the prevalence of stunting in Rwanda was highest in Western Province (44.9%), followed by Southern Province (40.5%). The heaviest burdens of stunting were borne by children under the age of 23 months (the highest prevalence, at 49.4%, was found in the age group 18–23 months). In addition, the lowest and second-lowest wealth quintiles bore the heaviest burden of stunting, at 48.6% and 44.7%, respectively. Indirectly, the high prevalence of malnutrition contributed to the infant mortality rate in Rwanda, which is currently estimated at 50 per 1000 live births (2).

2.1.4 Determinants of and gaps in addressing childhood stunting in Rwanda

Good nutrition, clean water, and a hygienic environment are crucial for any community health program aiming to prevent malnutrition; however, these necessities are out of the reach of many low-resource countries, including Rwanda. For this reason, the Government of Rwanda aims to achieve total water and sanitation coverage of the entire population of over 11 million by 2020 (9). To achieve this, an additional 4.9 million people must receive access to water supply and 6.5 million to improved sanitation. Over 85% of the population is estimated to be at risk of the consequences of poor personal hygiene practices, such as the lack of hand washing at critical times. Although the RDHS 2014–2015 showed that access to drinking water is relatively satisfactory at 73% and safe disposal of the stools of children aged under 5 years is currently at 88% (2), Rwanda still faces hygiene and sanitation challenges. It is estimated that around 45% of household latrines are unimproved or shared, and 88% of households don't have hand-washing stations. This situation results in health risks and is ineffective at disrupting the fecal-oral route of disease transmission. Diarrheal disease, which is one of the leading causes of childhood malnutrition and death, is responsible for 18% of deaths of children aged under 5 years in Rwanda, and many of these cases can be attributed to contaminated water and inadequate sanitation and hygiene (9).

Poverty and low education levels, especially of the mother, are important factors for chronic malnutrition. However, stunting is a multi-faceted problem, and the high levels of stunting in some districts of Rwanda cannot be fully explained. An underlying factor is poor feeding practices; 78% of children aged between 12–23 months are fed low-nutrient diets. The cycle of malnutrition often continues through generations; furthermore, the physical and mental damage associated

with poor fetal growth and stunting are irreversible after the age of 2 years (10). Thus, intervention to minimize the impact of malnutrition needs to start from conception and continue until the child is 2 years old, hence, the emphasis on the first 1000 days of life.

In Rwanda, most children who are at a high risk of malnutrition (and therefore stunting) come from the poorest households, which are larger and have no or very small landholdings, low levels of literacy, and poor access to services (EDPRS2). The low nutrition status in Rwanda is attributable to several inter-related factors; including insufficient knowledge and limited practice of key nutrition and water, sanitation, and hygiene (WASH) principles, holdings of only small parcels of farmland, and low household incomes (2).

The Ministry of Health, through the Community Based Environmental Health Promotion Program, is aiming to achieve 80% adherence to the 10 Golden Indicators of Safe Hygiene, as follows:(1) increasing the use of hygienic latrines in schools and homes from 28% to 80%;(2) increasing handwashing with soap and water at critical times from 34% to 80%; (3) improving safe drinking water access and handling in schools and homes to 80%; (4) establishing community health clubs (CHCs) in every village (from 0% to 100%); (5) achieving zero open defecation in all villages; (6) safe disposal of children's feces in every household (from 28% to 100%); (7) increasing households with bath shelters to 80%; (8) increasing households with rubbish pits to 80%;(9) increasing households with clean yards to 80%; and (10) increasing households with utensil-drying racks to 80%.

2.2 The Integrated Nutrition and WASH Activity (*Gikuriro* program)

Malnutrition and food security have been highlighted in the Economic Development and Poverty Reduction Strategy II as foundational issues that need coordinated, strengthened, and scaled-up community-based nutrition programs and information campaigns across the country. To address this issue, there is a need to support the implementation of existing district plans to eliminate malnutrition and to undertake communication campaigns to diversify household food production and consumption, e.g., the campaign to establish kitchen gardens in every household. Agriculture and social-protection interventions have to be linked to reach the most vulnerable children. Furthermore, there is a need to reactivate the Community-Based Environmental Health Promotion Program, since it plays a big role in infant care and nutrition, and has helped to reduce the exceptionally high levels of stunting throughout the country(11). It is against the above background and in partnership with the Rwandan Government that the United States Agency for International Development in Rwanda (USAID/Rwanda) supported a consortium of two International Agencies—Catholic Relief Services (CRS) and SNV, the Netherlands Development Organization—to implement the Integrated Nutrition and WASH Activity (INWA) called Gikuriro through decentralized Government of Rwanda systems and structures, and local civil

society organizations in eight target districts. Gikuriro is a 5-year (Nov 2015– Nov 2020) USAID funded program focusing on capacity building, nutrition, and WASH service delivery. The term *Gikuriro* (meaning "good growth" as opposed to stunting in Kinyarwanda), embodies CRS's and SNV's programmatic and operational approaches to improve the nutritional status of women of reproductive age and children aged under 5 years, especially in the first 1000 days of life. The *Gikuriro* program will focus on community-level service delivery interventions and on district-level capacity development.

It is in this context that the *Gikuriro* program has selected eight districts for intervention because of the lack of development partners working in them as of late 2014.On the basis of the preliminary results of the 2012 national census, it was anticipated that an estimated total of 200,000 children under the age of 2 years and 160,000 women will benefit from the *Gikuriro* program. The program aims to improve the health/nutrition and WASH indicators in these districts, which are still poor as reported by the RDHS 2014–2015[8] (Figure1).

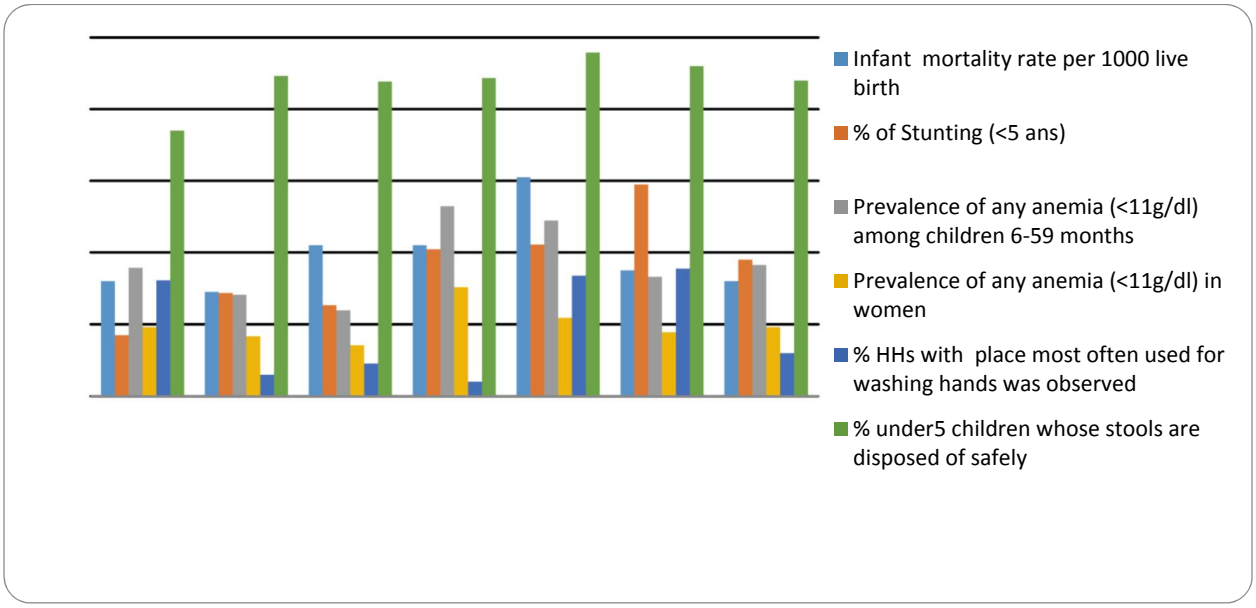


Figure 1: Health, nutrition, and water, sanitation, and hygiene situation in the eight districts selected for Gikuriro intervention

Strategically, the *Gikuriro* program seeks to reinforce the Rwandan government's nutrition and WASH efforts, to mobilize civil society and the private sector to accelerate progress toward the national goal of eliminating malnutrition. *Gikuriro* will implement activities that will lead to two intermediate results :(1) strengthening of the capacity of service providers and districts to achieve improved nutrition outcomes and (2) improvement in the household level of nutrition and WASH behaviors. The following indicators of the latter result were monitored in the target populations: mean scores on a test of nutrition knowledge among the target populations (disaggregated by gender and age), percentage of 6–23-month-old children receiving a minimum acceptable diet, mean scores on a test of hygiene knowledge among the target populations (disaggregated by

gender and age), percentage of caregivers who wash their hands before preparing food, and percentage of children aged under 5 years with diarrhea who received oral rehydration therapy.

Furthermore, the *Gikuriro* program will immediately address goals 2 and 6 of the Sustainable Development Goals. Goal number 2 aims to achieve zero hunger, while goal number 6advocates for clean water and sanitation for all by the year 2030.The *Gikuriro* program will work closely with existing nutrition and WASH platforms and partners to achieve its objectives. As mentioned above, a consortium of two international agencies, namely, the CRS and SNV, are implementing the *Gikuriro* project. They will work closely with three USAID-funded local civil society organizations: the Ubaka_Ejo Project implemented by the African Evangelistic Enterprise (AEE), the TurengereAbana Program implemented by Association François-Xavier Bagnoud (FXB) Rwanda, and the Gimbuka Program implemented by Caritas Rwanda, and other CHAIN partners. *Gikuriro* will have close relations with Caritas Rwanda in Ruhango District, AEE in Rwamagana District, and FXB Rwanda in Nyanza District. All three are USAID/Rwanda grantees and will implement nutrition and WASH activities in the respective districts. Additionally, existing platforms such as Scaling Up Nutrition at the national level and Joint Action Development Forum at the district level will play a big role in the implementation of the project. *Gikuriro* will also support the District Plan to Eliminate Malnutrition Committee to integrate interventions and to identify priorities.

3 AIMS AND OBJECTIVES

This Gikuriro's baseline survey was conducted in October 2016.The survey aims to detect strengths and gaps in addressing childhood stunting in Rwanda and to determine the status of nutrition and WASH indicators at the beginning of the program to enable better follow-up of the program interventions over the next 5 years. Additionally, gender analysis and WASH barriers analysis were incorporated to provide evidence about the barriers and facilitators affecting the adoption of optimal nutrition and WASH practices and to orient implementation strategies.

3.1 Main Objectives

- To establish the status quo regarding nutrition and WASH indicators in the eight target districts before the *Gikuriro* program is rolled out.
- To establish a benchmark for measuring program success and to identify challenges in achieving the desired goals. The results of the baseline assessment provided specific data as per the indicators set out in the Monitoring, Evaluation, Accountability, and Learning framework, against which targets and milestones were set/revised. Progress was measured over time within each result area.
- To verify that the proposed interventions within the program design are relevant and sufficient in scale and scope, in order to meet the defined targets. The baseline results will allow the program team to validate the proposed interventions and will inform programming decisions and support the program team to monitor the progress and results of the interventions.
- To provide a reference framework for the midterm and final evaluations of the program as well as the learning and research components.

3.2 Research Questions

The research questions that the baseline survey aimed to answer are as follows:

3.2.1 Child nutrition

- What is the level of awareness among biological mothers or other caregivers about infant feeding (0–6 months)?
- What is the level of awareness among biological mothers or other caregivers about complementary feeding?
- What percentage of women undertake early breastfeeding (within 1 hour of birth)?
- What is the prevalence of exclusive breastfeeding among children under 6 months?
- What percentage of children aged 6–23 months had consumed food items from multiple food groups in the 24 hours preceding the survey?

- What percentage of children consumed the minimum dietary diversity?
- What percentage of children aged 6–23 months received the minimum meal frequency?
- What percentage of children aged 6–23 months received the minimum acceptable diet?

3.2.2 Household food security

- What percentage of households experienced stress due to lack of food or money to buy food in the 30 days preceding the survey?
- What percentage of households owned a kitchen garden?
- What is the main source of food for household consumption?
- What is the percentage of utilization of different household coping strategies for the lack of food or money to buy food in the 30 days preceding the survey?
- What is the coping strategy used by most of the households?
- What is the average household coping strategies index (CSI) score in each district?
- What is the average Women's Dietary Diversity Score (WDDS)?
- What percentage of households have poor, borderline, and acceptable food consumption?

3.2.3 WASH

- What percentage of caregivers wash their hands before preparing food?
- What percentage of households safely dispose the feces of children aged under 3 years?
- What percentage of respondents are aware of the existence of CHCs in their community?
- What percentage of respondents participate in CHCs?
- How many households have soap and water at a handwashing station that is commonly used by the family members?
- What percentage of households have improved sanitation facilities?
- What percentage of households treat their drinking water properly?
- What percentage of households store their drinking water properly?

3.2.4 Morbidity and health-services utilization

- What percentage of children aged under 5 years have never received any vaccine for disease prevention?
- What is the prevalence of diarrheal disease among children aged under 5 years in the last 2 weeks?
- What percentage of children aged under 5 years with diarrhea received oral rehydration therapy?

- What percentage of women made their first visit to an antenatal care (ANC) clinic before the fourth month of pregnancy?
- What percentage of women attended four or more ANC consultations during their last pregnancy?
- What percentage of women attended at least three ANC visits with their husbands?
- What percentage of children received vitamin A supplementation in the 6 months preceding the survey?
- What percentage of children received deworming medication in the 6 months preceding the survey?
- What percentage of children received micronutrient powders in the 6 months preceding the survey?

4 SURVEY METHODS

4.1 Quantitative Assessments

4.1.1 Survey design

The *Gikuriro* baseline survey is a representative multi-stage sampling survey where two stages with Primary Units were selected using Simple Random Sampling and Secondary Units were selected with Systematic Random Sampling and employs a cross-sectional design. The survey was conducted at the community level in six districts of Rwanda: Ngoma, Kicukiro, Nyarugenge, Nyabihu, Kayonza, and Rwamagana. This baseline survey will be used as a frame of reference for the midterm and end-line surveys. For this baseline survey, data were collected on the current nutritional status of the primary target populations.

4.1.2 Desk review

A desk review was conducted with the prime objectives of shedding more light on the baseline survey in general and of identifying and defining key indicators/parameters. It involved a critical and contextual review of the policies and strategies of the donors (USAID, CRS, and SNV) and the country (Rwanda) and an analysis of relevant secondary data on the project.

4.1.3 Study location and population

The survey was conducted in randomly selected villages in the six intervention districts including Ngoma, Kicukiro, Nyarugenge, Nyabihu, Kayonza, and Rwamagana, which are located in three different provinces. Random selection was used to ensure that communities with different characteristics (e.g., food security and Ubudehe category) had an equal chance of being selected. In collaboration with the National Institute of Statistics of Rwanda (NISR), the research team randomly selected 108 villages from these six districts. Interviews were conducted in the community at the household level. One person per eligible household was interviewed, and information for other household members were recorded. In households with children aged under 5 years, the interviewee was the mother/caregiver. In other households, the head of the household was interviewed.

4.1.4 Sample-size calculation

Sample size determination under a given Relative Standard Error (RSE) for a reference indicator (proportion) *P*:

$$n = Deft^2 \frac{(1/P - 1)}{\alpha^2}$$

For a national level indicator, 5% *RSE* is a good precision and 10% *RSE* is acceptable.

For a domain level indicator 10% *RSE* is a good precision and 20% *RSE* is acceptable that is why we do prefer to use this 10% not 5% as RSE.

Where:

n = net sample size

P = 0.38 Rwandan stunting Prevalence

Z = Confidence coefficient of 1.96 (confidence levels of 95%)

RSE = 10% (margin error)

Therefore: n = 363

The minimum sample size in each stratum (District) will be 363 households and the total sample size will be 363*6=2178 households. Overall the minimum sample size is 2178 and the expected a relative standard error is 10%.

The total sample was equally distributed over the 6 Districts making up 363 Household per District. This means that with a sample size of 363 observations 80% power at 0.05 significance that the final sample size of the survey will be 2178

The sample size for children was calculated based on the prevalence of minimum dietary diversity at the national level. The following parameters were taken into consideration: confidence level of 95%, relative standard error of 10%, design effect of 1.3, and non-response rate of 1%.

Table 1: Sample-size calculation

Indicator	Estimated prevalence	± desired precision	Design effect	Sample size in No of children	Average household size	% children under 5	% non-response households	Households to be included
Minimum dietary diversity	17.8	10	1.3	80	4.3	14.6	1	427

In scenario where you have two sample sizes, first thing would be to ensure one unit of selection and in our case we considered a household. The MIYCN sample was therefore converted to households. In calculating the domain, we determined that the minimum sample size for households was 427 households per district, as we expected that this figure would include at least 80 children aged under 2 years in each district. The sample size calculation assumed equal probability for each district, so that the required statistical power of 80% would be achieved.

As observed, we have two sample sizes 363 as computed for household level indicators and 427 for MIYCN indicators. The research team therefore used the larger sample size for all indicators and thus 427 households was the sample for each district.

4.1.5 Sampling strategy and recruitment

The study units were selected from each district by using a stratified two-stage cluster sampling method. The districts were the primary units of the study, and six administrative districts were taken into consideration within the frame. From each village, households were selected using a systematic random sampling approach. One interview was conducted per household, and information about all household members was recorded. The inclusion and exclusion criteria for the households visited were respected.

4.1.6 Training of enumerators

Final-year students from the Department of Human Nutrition and Dietetics, School of Public Health, University of Rwanda were recruited as enumerators for the quantitative assessments. The students were intensively trained for 4 days on survey objectives, home entry, interviewing skills, questionnaire contents, electronic tablet use, and general data-collection approaches. Data-collection activities were supervised on a daily basis by the research team of the College of Medicine and Health Sciences, University of Rwanda.

4.1.7 Survey instruments

In order to base the provisions of the *Gikuriro* program survey on previous research and already existing information in the context of ongoing monitoring and evaluation procedures, we conducted a literature review to inform the development of the study instruments. Many questions that were used in the questionnaire had been previously used and validated in other studies, including the RDHS 2014–2015(2).The survey instrument was translated into Kinyarwanda. The instrument for the *Gikuriro* program survey contained questions regarding the participant's socio-demographic characteristics, socioeconomic status, nutrition and food access, WASH, morbidity, and health-services utilization.

4.1.8 Ethical approval and authorization

The baseline survey was granted ethical approval from the Rwanda National Ethical Committee. Authorization to access health facilities was approved by the Ministry of Health after a scientific review by the Rwandan National Health Research Committee. Finally, a statistical visa (meaning the permission of conducting household survey from National Institute of Statistics Rwanda) was provided by the NISR.

4.1.9 Data collection and management

The School of Public Health from the National University of Rwanda was contracted as a consultant group to implement all activities of the *Gikuriro* baseline survey, such as: organizing

logistics for training and data collection and reporting based on the established and approved protocol, instruments, and tools. Coordination was ensured by the School of Public Health and *Gikuriro staff*. During a period of 4 days, a team of 48 experienced surveyors and 6 supervisors were intensively trained on the various questionnaires and data-collection methods and tools. To increase the level of engagement and understanding of the interviewers, we prepared technical sessions on all WASH and nutrition health topics. Data were collected using electronic tablets, on which the Survey CTO software for data collection, based on Open Data Kit, had been installed. The use of tablets for data collection was a positive experience; it enabled close quality monitoring of data collection in real time and was an engaging work tool for the interviewers.

Selected study participants were interviewed in privacy. The interview was only conducted when confidentiality was fully guaranteed. Moreover, the interview could be paused if the respondent asked for it. The data were collected using online system Survey platform for data-collection, based on Open Data Kit (ODK). A daily debriefing with surveyors was done by team leaders together with supervisors and after data were daily sent to a central server of gikuriro.surveycto.com (Kigali, Rwanda) which has a high-security. Raw data were transferred from Server to STATA, and import into SPSS Inc version 20 for the data cleaning and analysis by the statistician for this survey. The descriptive statistics (frequencies, percentage, cross-tabulation, mean and confidence intervals) for key variables (age, sex, marital status, education, etc) were used to check the inconsistencies and outliers of the data being collected and feedback was given to the surveyors.

4.2 Qualitative Assessments

The qualitative assessments of this survey aimed at gathering the thoughts, perceptions, opinions, and appreciations of key program stakeholders towards the *Gikuriro* program, with the aim of providing baseline information for monitoring, evaluation, and readjustment of the program design and implementation.

4.2.1 Data collection management and analysis

Qualitative information was collected in a field notebook in the program offices supplemented by voice recorders. In-depth key informant interviews (KIIs), focus group discussions (FGDs), and direct observation were conducted by two qualified and well-trained enumerators from the School of Public Health, with one enumerator acting as a moderator of the discussion and the other as a field note taker. KIIs were conducted at the workplaces of the key informants and at the residences of the program beneficiaries. Interviews were conducted face to face. The enumerators started by filling out a prepared logbook with identifier variables such as socio-demographic information from the participants and all information deemed necessary to understand the collected qualitative data. For the FGDs, participants were seated in a semi-circle

to facilitate discussion and were labeled with letters to allow the note-taker to know who is saying what, in an anonymous way. Both KIIs and FGDs were recorded using voice recorders in addition to the everyday field note taking. At the end of each day, the field notes were summarized by the note-taker, so that a daily summary of the collected information was available. In addition, extended transcribing of the records in a detailed manner was performed.

Some KIIs were conducted in Kinyarwanda and others in English, depending on the language preferred by the key informant. The FGDs conducted in Kinyarwanda were translated to English. In regards to the analysis, all English transcripts in Microsoft Word of the FGDs, KIIs, and direct observation were read and re-read for a deep understanding of the collected information; this step was followed by the interpretation of the collected data. Then, a codebook was developed whereby all key themes were identified in regards to the research-specific objectives, and the data were coded, i.e., labels were attached to lines of text, so that the research team could group and compare similar or related pieces of information when analyzing the qualitative data. For the analysis, we used Atlas.ti version 7.1.4, a qualitative data-analysis software. Finally, reducing and displaying of the key information or quotations were done, together with producing concurrence tables to know the saturation of information. Briefly, all five steps of qualitative data analysis (reading, interpreting, coding, reducing, and displaying) were complied with for this survey to ensure consistency.

To tie the quantitative and qualitative information together, triangulation–the use of different measurements or observations of the same phenomenon to ensure that the researcher has an accurate view of the situation being studied—was done to have a final snapshot of the health, nutrition, and WASH status in the surveyed communities'/program catchment areas, enhance the credibility of the findings, and enrich the acceptability of the conclusions.

4.2.2 Qualitative data collection methods

4.2.2.1. FGDs

At the local level, discussions were conducted with service providers and program beneficiaries, in groups of 10 members. This allowed us to assess aspects of the program results at the local level, obtain feedback from the beneficiaries, and triangulate data. Particular attention was paid to the program beneficiaries, and FGDs were conducted separately for men and women. We conducted a total of 24 FGDs: 4 FGDs per district. The members for each focus group were recruited from 10 villages in one randomly selected sector of each district. The composition of the focus groups was as follows: community health workers (CHWs) (Binome and ASM), female heads of households, male heads of households, village ASOC, and CHC representatives.

4.2.2.2. KIIs

We interviewed key stakeholders in the health, nutrition, and WASH program. The following categories of people were interviewed: district administrative staff (Director of Health, District Hygiene and Sanitation Officer), district hospital staff (hospital nutritionist, CHW supervisor, Hospital Environmental Health Officer), health center staff (hospital nutritionist, CHW supervisor, Hospital Environmental Health Officer), and local implementing partners (In nutrition and WASH domain). Only three KIIs could not be conducted due to non-availability of the respondents. The quantitative and qualitative assessments have been summarized in Table 3.

4.2.3 Summary of Quantitative and Qualitative approaches

Table 2: Qualitative and quantitative approaches for data collection

Methods	Description	Objective
Quantitative assessment (household survey)	Administration of household questionnaire to the selected households in the program area	To collect data on availability of, access to, and utilization of nutrition and WASH services in the program area
Literature review	Study and review of selected documents relevant to the baseline survey	To be informed about the background and context for the study and monitor progress through secondary sources
Key informant interviews	Face-to-face interviews with key stakeholders, making use of a set of topics for discussions	To gather qualitative data from a variety of key informants
Focus group discussions	Discussions at the local level with service providers and program beneficiaries	To assess the program results at the local level, obtain feedback from beneficiaries, and triangulate data

4.3 Study Limitations

This cross-sectional study was conducted to collect baseline data in the intervention area, which was selected on the basis of programmatic considerations. The study used self-reported data, so it is likely that some participants reported what they perceived that the researchers wanted to hear.

Food security in Rwanda is influenced by seasons. Data collection was conducted from mid-September to early October, which is a lean season and the period when households experience difficulties in food access. Thus, our results represent only one season, which is the worst in terms of food access. Our findings seem to corroborate one of the five rounds of the Food and Nutrition Security Monitoring System conducted since 2012, which together show a clear seasonal trend in food insecurity, which peaks each year in September.

There is a limited ability to generalize data collected from large areas at the district level to smaller areas at the sector level. The sample was not designed to be statistically representative for villages.

5 SURVEY RESULTS

5.1 Sample Distribution

We aimed to collect baseline data from representative samples of 427 households per district, which were expected to include 80 children aged less than 2 years, based on the prevalence of minimum dietary diversity among children at the national level (2) (Table 1).

Table 3: Baseline survey distribution among districts supported by the *Gikuriro* program

Households visited per district		
District	Frequency	Percentage
Nyarugenge	422	16.7
Kicukiro	414	16.4
Nyabihu	423	16.8
Rwamagana	416	16.5
Kayonza	430	17
Ngoma	420	16.6
Total	2525	100

5.2 Socio-economic and Demographic Characteristics

5.2.1 Family size and sex distribution

In total, 11,957 individuals were surveyed in six districts, of which 6323(52.88%) were women and 5634(47.12%) were men (in the weighted sample). A total of 5775(48.29%) respondents were living in families with six or more members, while 1771(14.81%) respondents lived in families of 3 or fewer persons. Overall, more women were surveyed than men across all districts (Table 4).

Table 4: Family size and sex distribution

	Nyarugenge	**Kicukiro**	**Nyabihu**	**Rwamagana**	**Kayonza**	**Ngoma**	**Total**
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**N (%)**
Family size							
1–3	256 (12.14)	299 (15.03)	311 (15.68)	318 (17.18)	281 (13.12)	306 (16.26)	1771 (14.81)
4–5	804 (38.12)	693 (34.82)	692 (34.88)	767 (41.44)	755 (35.26)	700 (37.19)	4411 (36.89)
≥6	1049 (49.74)	998 (50.15)	981 (49.45)	766 (41.38)	1105 (51.61)	876 (46.55)	5775 (48.3)
Total	2109 (100)	1990 (100)	1984 (100)	1851 (100)	2141 (100)	1882 (100)	11,957 (100)
Mean household size							
Mean(SD)	5.9(2.3)	5.7(2.2)	5.5(2.0)	5.2(1.8)	5.8(2.1)	5.4(2.0)	5.6(2.1)
Sex							

Male	991 (47)	970 (48.7)	886 (44.7)	874 (47.2)	999 (46.7)	914 (48.6)	5634 (47.1)
Female	1118 (53)	1020 (51.3)	1098 (55.3)	977 (52.8)	1142 (53.3)	968 (51.4)	6323 (52.9)
Total	2109 (100)	1990 (100)	1984 (100)	1851 (100)	2141 (100)	1882 (100)	11957 (100)

5.2.2 Household Ubudehe category and sex of the head of the household

It was observed that 71.67% of all heads of households were male, and 28.33% were female. According to the Ubudehe program, Rwandan households are placed in four categories based on their socioeconomic status. In category4, belong the most affluent households, while the poorest households fall in category 1. Based on the self-reported Ubudehe status, 13% of households fell in category 1 (these were families who did not own a house and could hardly afford to meet their basic needs); 36.9% of households belonged to category 2 (those who have a dwelling of their own or are able to rent one but rarely get full time jobs). Many households in Rwanda fall in Ubudehe category 3 (those who have a job and farmers who go beyond subsistence farming to produce a surplus which can be sold); a similar distribution of Ubudehe categories was found in the *Gikuriro* target area, except that Nyabihu and Ngoma had a lower percentage of Ubudehe category 3 households and a higher proportion of Ubudehe category 1 (18.2%and 18.4%, respectively) and category 2 (44.8% and 45.6%, respectively) households (Table 5). Among all the districts, only six (0.2%) households belonged to Ubudehe category 4.

Table 5: Ubudehe categories and sex of the head of the household

	Nyarugenge n(%)	**Kicukiro n(%)**	**Nyabihu n(%)**	**Rwamagana n(%)**	**Kayonza n(%)**	**Ngoma n(%)**	**Total N (%)**
HH Ubudehe category							
Ubudehe 1	48(11.4)	38(9.3)	77(18.2)	22(5.3)	57(13.3)	77(18.4)	319(12.7)
Ubudehe 2	153(36.3)	129(31.5)	189(44.8)	124(29.8)	143(33.3)	191(45.6)	929(36.9)
Ubudehe 3	218(51.8)	240(58.7)	155(36.7)	269(64.7)	230(53.5)	151(36)	1263(50.2)
Ubudehe 4	2(0.5)	2(0.5)	1(0.2)	1(0.2)	0(0)	0(0)	6(0.2)
Total	421(100)	409(100)	422(100)	416(100)	430(100)	419(100)	2517(100)
HH headship sex							
Male	305(72.45)	309(75.55)	283(67.06)	289(69.47)	319(74.19)	299(71.36)	1804(71.67)
Female	116(27.55)	100(24.45)	139(32.94)	127(30.53)	111(25.81)	120(28.64)	713(28.33)
Total	421(100)	409(100)	422(100)	416(100)	430(100)	419(100)	2517(100)

5.2.3 Education and Ubudehe categories

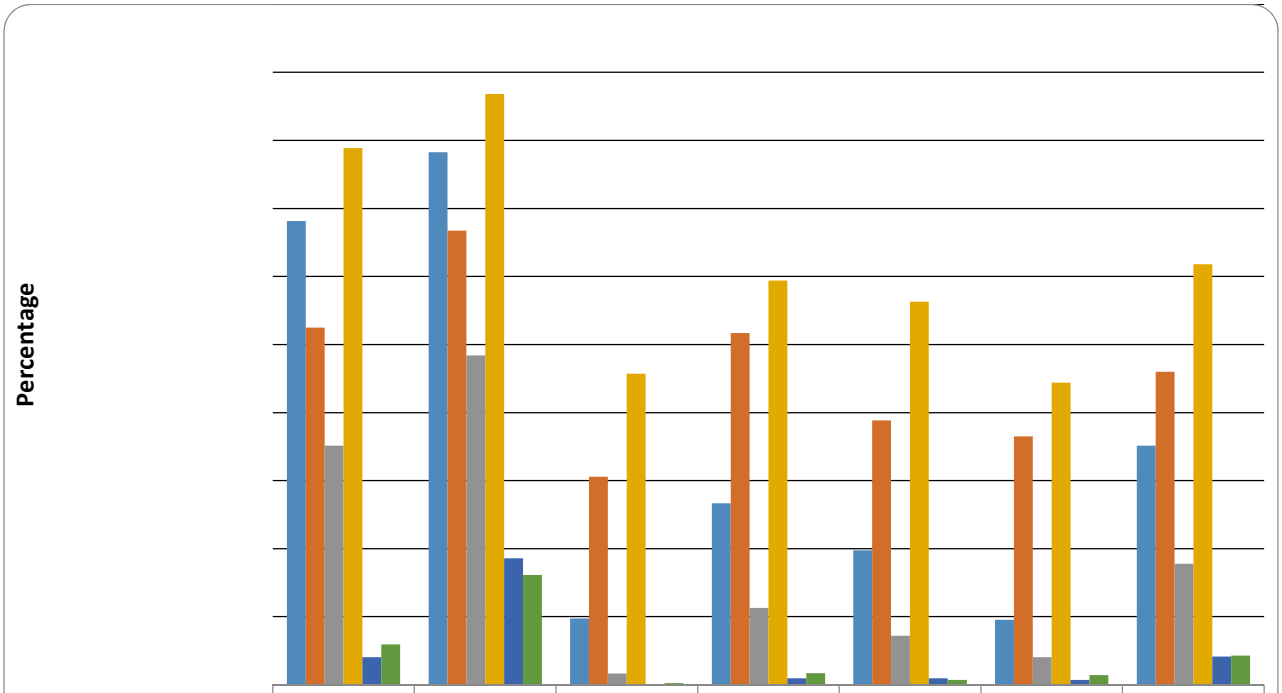
Education is often used as a measure of individual empowerment to seek out information, access resources, and make choices in the area of nutrition. In addition, as many nutrition education programs take place in schools, the number of years of schooling an individual completes can determine their level of exposure to nutrition information and possibly their nutrition status. We found that education levels of the head of the household significantly differed across Ubudehe categories. Most educated people with secondary 118(71.52%) and Higher education level 56(84.85%) are in Ubudehe category 3 (See table 6).

Table 6: Education and Ubudehe categories

	Last education level of head of household					
Ubudehe category	**None**	**Primary**	**Secondary**	**Vocational training**	**Higher education**	**Total**
	n(%)	**n(%)**	**n(%)**	**n(%)**	**n(%)**	**N(%)**
Ubudehe 1	230(17.89)	84(8.87)	1(0.61)	2(6.45)	1(1.52)	318(12.74)
Ubudehe 2	532(41.3)	325(34.32)	45(27.27)	10(32.26)	8(12.12)	920(36.84)
Ubudehe 3	524(40.68)	536(56.6)	118(71.52)	19(61.29)	56(84.85)	1253(50.18)
Ubudehe 4	2(0.16)	2(0.21)	1(0.61)	0(0)	1(1.52)	6(0.24)
Total	1288(100)	947(100)	165(100)	31(100)	66(100)	2497(100)

5.2.4 Household assets

Household characteristics such as material assets can reflect socioeconomic status and/or purchasing power, which can be important determinants of an individual's ability to access nutrition services. Respondents were asked if their households possessed the following assets: electricity, radio, refrigerator, television, mobile phones, and/or computers (Figure 2, Table 7). It was revealed that household characteristics did not vary greatly with sex or age; however, they did vary considerably by district. In all districts, the majority of respondents reported having a mobile phone and radio in their households, with the lowest percentages of mobile (44%) and radio (37%) ownership being found in Ngoma. Nyabihu and Ngoma had the lowest percentages of electricity and television possession. Kicukiro had the highest rate of households with electricity (78%), followed by Nyarugenge (68%). Overall, access to radio was very high, while possession of televisions and computers was rare. Eight in ten (84.7%) of the respondents said that they had not needed to sell any of their household assets in the last6 months.



	Nyarugenge	Kicukiro	Nyabihu	Rwamagana	Kayonza	Ngoma	Total
Electricity	68.17	78.24	9.72	26.68	19.77	9.55	35.12
Radio	52.49	66.75	30.57	51.68	38.84	36.52	46.01
Television	35.15	48.41	1.66	11.3	7.21	4.06	17.8
Mobile telephone	78.86	86.8	45.73	59.38	56.28	44.39	61.78
Refrigerator	4.04	18.58	0	0.96	0.93	0.72	4.13
Computer	5.94	16.14	0.24	1.68	0.7	1.43	4.29

Figure 2: Household assets

Table 7: Sale of household assets

	Nyarugenge	Kicukiro	Nyabihu	Rwamagana	Kayonza	Ngoma	Total
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	N (%)
In the past 6 months, have you had to sell any household assets?							
No	392(93.1)	377(92.2)	323(76.5)	351(84.4)	342(79.5)	364(86.8)	2149(85.4)
Yes	29(6.9)	32(7.8)	99(23.5)	65(15.6)	88(20.5)	55(13.1)	368(14.6)
Total	421 (100)	409 (100)	422 (100)	416 (100)	430 (100)	419 (100)	2517 (100)

5.2.5 Household livestock ownership

The results in the table 8 show that less than a half 1104(43.9%) of interviewed households own any livestock, other farms animal or poultry (Cows, goats, sheep, chickens, pigs, rabbits).

Table 8: Household livestock ownership by district

	Nyarugenge	Kicukiro	Nyabihu	Rwamagana	Kayonza	Ngoma	Total
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	N (%)
Does this HH own any livestock, other farms animal or poultry (Cows, goats, sheep, chickens, pigs, rabbits)?							
Yes	70(16.6)	85(20.8)	210(49.8)	247(59.4)	235(54.7)	257(61.3)	1104(43.9)
No	351(83.4)	324(79.2)	212(50.2)	169(40.6)	195(45.3)	162(38.7)	1413(56.1)
Total	421(100)	409(100)	422(100)	416(100)	430(100)	419(100)	2517(100)

5.2.6 Main source of household income

Wealth, income status, and purchasing power can affect an individual's access to education, information, and nutrition. A source of income gives stability to the household income status. As a measure of socioeconomic status, respondents were asked about their household source of income category. Most of the respondents (67.8%) stated that their household incomes were derived from two main sources: sale of agricultural produce (35.1%) and working as a day laborer (32.7%). No significant differences in the source of income were observed among the six districts, except that in Nyarugenge and Kicukiro, the most common source of income was full-time employment and trading/small business in urban areas (Table 8).

Table 9: Main sources of income

Main income source	Nyarugenge n (%)	Kicukiro n (%)	Nyabihu n (%)	Rwamagana n (%)	Kayonza n (%)	Ngoma n (%)	Total N(%)
Sale of agricultural produce	49(11.6)	59(14.4)	183(43.4)	173(41.6)	198(46)	221(52.7)	883(35.1)
Sale of livestock or livestock products	1(0.2)	2(0.5)	10(2.4)	6(1.4)	4(0.9)	9(2.1)	32(1.3)
Day laborer	133(31.6)	118(28.9)	166(39.3)	139(33.4)	139(32.3)	129(30.8)	824(32.7)
Remittances	11(2.6)	15(3.7)	1(0.2)	10(2.4)	7(1.6)	7(1.7)	51(2)
Full-time employment	58(13.8)	91(22.2)	10(2.4)	23(5.5)	12(2.8)	14(3.3)	208(8.3)
Trading/small business	84(20)	58(14.2)	7(1.7)	16(3.8)	21(4.9)	9(2.1)	195(7.7)
Loan	2(0.5)	0(0)	1(0.2)	1(0.2)	2(0.5)	1(0.2)	7(0.3)
Other	83(19.7)	66(16.1)	44(10.4)	48(11.5)	47(10.9)	29(6.9)	317(12.6)
Total	421(100)	409(100)	422(100)	416(100)	430(100)	419(100)	2517(100)

More than a half (66.48%) of surveyed household earn less than 50 000 Rwf per month, with a large disparity between rural and urban area.

5.2.7 Household savings

Savings are the leading product type and one of the main drivers of financial inclusion for Rwanda. This is encouraging as savings enable a family to create wealth, pay for household furniture and equipment, and acquire a good nutrition status. We found that 85.8% of families could save at least a quarter of their monthly income (Table 9); 35.8% stored their money in their own house, rather than in a bank, which is not good for their money security. The reasons for keeping their savings at home may be related to factors such as convenience and accessibility. Other popular methods of saving were informal savings schemes such as Savings and Internal Lending Communities (SILC) groups (25% of households) and formal non-banking savings products such as Savings and Credit Cooperative Organizations (SACCOs;13%of households).

Table 10: Savings

Variable	Nyarugenge n (%)	Kicukiro n (%)	Nyabihu n (%)	Rwamagana n (%)	Kayonza n (%)	Ngoma n (%)	Total N(%)
Proportion of household monthly income added to savings							
0%–25%	169(90.4)	131(78.4)	173(85.2)	168(83.6)	150(88.8)	147(88.6)	938(85.8)
26%–50%	17(9.1)	33(19.8)	19(9.4)	25(12.4)	19(11.2)	14(8.4)	127(11.6)
51%–75%	1(0.5)	3(1.8)	5(2.5)	3(1.5)	0(0)	4(2.4)	16(1.5)

76%–100%	0(0)	0(0)	6(3)	5(2.5)	0(0)	1(0.6)	12(1.1)
Total	187(100)	167(100)	203(100)	201(100)	169(100)	166(100)	1093(100)
Place of household savings							
SILC group	68(16.2)	74(18.1)	141(33.4)	113(27.2)	135(31.4)	97(23.2)	628(25)
Bank	79(18.8)	136(33.3)	22(5.2)	33(7.9)	15(3.5)	17(4.1)	302(12)
SACCO	43(10.2)	44(10.8)	41(9.7)	64(15.4)	69(16)	66(15.8)	327(13)
MFI	6(1.4)	10(2.4)	4(0.9)	4(1)	1(0.2)	1(0.2)	26(1)
In household	156(37.1)	118(28.9)	139(32.9)	140(33.7)	174(40.5)	175(41.8)	902(35.8)
Other	69(16.4)	27(6.6)	75(17.8)	62(14.9)	36(8.4)	63(15)	332 (13.2)
Total	421(100)	409(100)	422(100)	416(100)	430(100)	419(100)	2517(100)

SACCO, Savings and Credit Cooperative Organization; SILC; Micro Finance Institutions (MFI),

Apart from the savings in formal banks and SACCOs, and informal SILCs, the FGDs and KIIs confirmed that there was a promise by partners/local agencies to support vulnerable households to start saving, and lending schemes were made available at the community level in their package of intervention.

"*According to what I can see where I live, I realize that some strategies are starting to be implemented. These days, there is a project of CARITAS, which started here. They told us that it will work in three areas of intervention, but they started in the area of saving and then they continued by training people about kitchen gardens, which are being built. And thirdly, they have given domestic animals to some families, and it will continue,*" said a male FGD participant from Nyabihu.

However, this strategy has not yet been scaled up in all districts, and there are still some districts where the people are waiting for the strategy to be integrated in the intervention framework as a way to sustain existing initiatives. Saving and lending schemes have shown success in some districts as a way to maintain the activities of CHCs. When people save together and lend money to each other, it is hard to stop the initial activity that gathered them, especially the CHCs, which seem to operate in this way in more than one district (Ngoma, Kicukiro, and probably others).

"They will have a kind of saving scheme in order to help among themselves even to solve some hygiene-related issues such as having latrines. … Briefly, these clubs will be helpful," said a key informant from Ngoma.A local implementing partner from Ngoma said *"They have trained beneficiaries about new techniques of cultivating, internal lending, saving and credit, and kitchen gardens. After getting those trainings, they immediately start implementing the skills acquired in training."*

A key informant from Kicukiro said "*They were very useful. We used to find cleanliness everywhere, and it was also helpful for them; they used to meet in associations, putting some money together for credit and saving, which allowed them to solve some of their problems. CHCs had been like channels through which they could meet and help each other to find solutions to different life problems like toilets and others.*"

5.3 Household Food Security

5.3.1 Household food access and production

All households were asked if they had experienced stress due to lack of food or money to buy food in the 30 days preceding the survey. The majority of households (69.2%)answered in the affirmative to this question (Table 10).Thus, more than half of all the households sampled had food-access issues. Most households (37.5%) bought the majority of their food from the market, which made them vulnerable to fluctuations in food prices.

This vulnerability was even more serious for poor households, which cannot afford high prices of food items in the market. A female FGD participant from Nyabihu said "*They can occasionally get sweet potatoes and beans for lunch, and this is for the whole day. They may lack vegetables that would otherwise go with those potatoes and beans for it to be appropriate because one does not have money to buy food varieties from markets."*

This problem in food access becomes worse during the dry season, when households do not have the expected harvest and cannot cultivate more food since there is no hope for rain (based on quotes from participants in Nyabihu, Ngoma, and Kayonza). "W*hat I can say is that during rainy season at least people can have appropriate nutrition. During this time because of drought, we all depend on markets, and our nutrition is negatively affected,"* said a female FGD participant from Nyabihu.

Another female FGD participant from Kicukiro highlighted well how expensive are food items in the market with the following words: "*Foodstuff is expensive. We used to eat only 1000 RwF per day, but these days, foodstuff is expensive and that money is not enough per day. Prices on market keep increasing day after day, while our income does not increase."*

Poor families that do not own land plots are the ones that suffer the most. A female FGD participant from Nyabihu said*" In this area, people who get appropriate food are few, including those who own lands. Everyone depends on markets. For example, I don't own a land where I can get like a kilogram of beans. Everything that I get is from markets, or if I work for food from a neighbor."*

The situation becomes more complicated when people are jobless or do not have any income-generating activity; thus, there is a need for graduate youth to have something to do to support their families. A female FGD participant from Kicukiro said "*I also need to add that foodstuff is*

expensive. In addition, there are no jobs for income generation. Parents do not have jobs, and children graduated from school are jobless. If we can have jobs and generate money, we can be able to buy that foodstuff that is expensive."

Overall, most participants raised the issue of expensive items and unavailability of items in the markets. Through the Ministry of Agriculture and Animal Resources, the current National Food and Nutrition Strategic Plan recommends that all households should have a kitchen garden to improve access to vitamin- and mineral-rich vegetables. However, kitchen garden ownership is still low: only 31% in all six districts. Among households that owned kitchen gardens, green vegetables-Amaranths ("*lengalenga*") were the most commonly grown food item.

Informants in the qualitative analysis said that the Government of Rwanda has made a considerable effort in fighting against malnutrition through different strategies, including kitchen gardens. However, not every household has benefited from these strategies, and thus, there is a need to scale the intervention up to include all households. A male FGD participant from Kayonza said "*Thank you. I can say that now the government has made an effort to fight against malnutrition. They act as a cooperative. They chose a group of people who take the responsibility of setting up kitchen gardens from household to household. However, this activity is not done for everyone; it is only done for selected households. That is how it is.*"

All participants and key informants recognized the role of kitchen gardens in food security and alleviating malnutrition. Every citizen was sensitized about having a kitchen garden in his or her compound. There are some areas where it was even an obligation, and authorities would check for their presence in each household, but today people are somehow more relaxed about it. A male participant from Kicukiro said "*But you asked us about something important. I don't want that we jump it. It is about kitchen garden. It used to be an obligation. An executive secretary or other local leaders used to check on that, but currently, maybe they have relaxed. Most of us are renting houses, but even the one who comes to own a house cannot remember to take sacks in which they can plant vegetables like onions, berries, and others. Since it used to be a law, and it has been relaxed, no one is checking on them anymore. Few people are still having those kitchen gardens. Even now, on our way back home at Gitega, we can see only few of them I think.*"

Thus, there is a need to reinforce this initiative again through home visits. "*Also efforts would be invested in educating people about the ownership of the kitchen gardens. We have been touring in the households, and we have seen that some people consider that initiative as the government's program that is even implemented by force, and therefore, people can do that as a way of adhering to government's initiative and not for their own interest,"* said a key informant from Ngoma.

Kitchen gardens remain a challenge for households that rent houses from time to time (according to local authorities, health service providers, CHWs, etc.), and when they have to leave these

houses, they have to set up another kitchen garden where they are going, and the new occupant of the household may not be interested in managing the existing kitchen garden in urban area.

Table 11**: Household food insufficiency, food production, and main sources of food consumption**

Variable	Nyarugenge n(%)	Kicukiro n(%)	Nyabihu n(%)	Rwamagana n(%)	Kayonza n(%)	Ngoma n(%)	Total N(%)
Lack of food or money to buy food in the 30 days preceding the survey							
Yes	272(64.6)	200(48.9)	361(85.5)	298(71.6)	329(76.5)	283(67.5)	1743(69.2)
No	149(35.4)	209(51.1)	61(14.5)	118(28.4)	101(23.5)	136(32.5)	774(30.8)
Main source of food for household consumption							
Harvesting	34(8.1)	27(6.6)	148(35.1)	128(30.8)	131(30.5)	143(34.1)	611(24.3)
Buying food from the market	288(68.4)	296(72.4)	95(22.5)	118(28.4)	70(16.3)	77(18.4)	944(37.5)
Both	38(9)	46(11.2)	64(15.2)	93(22.4)	121(28.1)	107(25.5)	469(18.6)
In kind payment	43(10.2)	31(7.6)	106(25.1)	67(16.1)	97(22.6)	84(20)	428(17)
Other	18(4.3)	9(2.2)	9(2.1)	10(2.4)	11(2.6)	8(1.9)	65(2.6)
Households with kitchen gardens(verified by observation)							
Kitchen garden present	62(14.7)	74(18.1)	188(44.5)	156(37.5)	151(35.1)	150(35.8)	781(31)
Kitchen garden absent	359(85.3)	335(81.9)	234(55.5)	260(62.5)	279(64.9)	269(64.2)	1736(69)
Types of vegetables grown in the kitchen garden							
Green vegetables	61(98.4)	67(90.5)	177(94.1)	152(97.4	147(97.4)	148(98.7)	752(96.3)
Cabbages	0(0)	0(0)	1(0.5)	1(0.6)	0(0)	0(0)	2(0.3)
Carrot	0(0)	0(0)	0(0)	0(0)	2(1.3)	0(0)	2(0.3)
Onion	0(0)	0(0)	3(1.6)	1(0.6)	0(0)	0(0)	4(0.5)
Other	1(1.6)	7(9.5)	7(3.7)	2(1.3)	2(1.3)	2(1.3)	21 (2.7)

5.3.2 Coping Strategies Index (CSI)

The CSI is an indicator of household food security that is used to measure the coping strategies used by households when they are unable to obtain enough food. A series of questions were asked about how households managed to cope with any shortfall in food for consumption in the 30 days preceding the survey. The CSI aims to establish the food-security status of households by calculating and comparing the CSI scores of the households. Changes in CSI scores can be monitored to determine whether household food-security status is declining or improving.

The most commonly used coping strategy was the consumption of less-preferred and less-expensive food such as maize flour. This strategy was used every day of the week by 20.1% of households, 4–6 times a week by 35.0% of households, 2–3 times a week by 28.8% of households, at least once a week by 10.3%, and never used by 5.8% of households (Table 11).A total of 1468 (83.9%) households indicated that they rely on less-preferred and less-expensive food two or

more times a week. A total of 1186 (68.1%) households indicated that they reduce the number of meals eaten in a day two or more times a week, while 249 (14.3%) households reduced the number of meals eaten in a day all the time. A total of 1087 (62.4%) households purchased food on credit two or more times a week. A total of 1133 (65.1%) households limited portion sizes of meals two or more times a week. A total of 856 (49.2%) households skipped eating for an entire day at least once a week.

During the qualitative assessments, some respondents stated they have even passed a few nights on an empty stomach due to the lack of something to eat. A male FGD participant from Nyarugenge said "*If they don't have food maybe they sleep without eating, or they eat only once a day. What do you expect from that help?*" Another participant from Kicukiro confirmed this in these sad words: "*That situation may happen where the parent can tell you that both parents and children sleep without eating because they have been moving, moving, moving until when they no longer have anything, living in poverty.*"

Given the difficulties in accessing food which is expensive for poor families, some of them rely on less expensive foodstuffs such as maize flour, available everywhere in the country. A male FGD participant from Kicukiro district said: "*As my friend was saying, there is a challenge of buying food. In a low income family, they rely on Akawunga for 500 Rwf per kg. Beans have become expensive at 500 Rwf per kg. It is very difficult to buy vegetables and fruits*".

Due to climate variability, there are not enough crops, and some families do not eat as frequently as they used to before. A female FGD participant from Nyabihu said "*Currently, we do not get that appropriate meals because we did not produce much of crops."*Although there were some households that tried their best to find two meals a day, many ate only once a day. A female participant from Ngoma said "*In general, in this community, we have a habit of taking food twice a day: at midday and in the evening. It depends on household economic ability, but in general, it is twice a day."*

Infants from poor families were the most vulnerable category, as their parents must wake up early to go out for unexpected jobs. A CHW from Ngoma expressed this in these words: "*He doesn't get porridge in the morning, and she is caring only about work! You find that instead of eating three or four times, but you find that she is eating like once or twice because of loving to work. Then, you find that it is causing having less weight; it causes her problems. Even that child has a problem; he is not going to get enough breast milk. There is sometimes we see that problem."*

Table 12: Utilization of different household coping strategies for lack of food or money to buy food in the 30 days preceding the survey (N=1743)

Coping strategy	Never: 0 times in the last month	Hardly: once a week	Once in a while: 2–3 times/week	Pretty often: 4–6 times/week	All the time: everyday

	n(%)	n(%)	n(%)	n(%)	n(%)
Rely on less-preferred and less-expensive food	101(5.8)	180(10.3)	502(28.8)	610(35.0)	350(20.1)
Borrow food or rely on help from a friend/relative	761(43.7)	383(22.0)	360(20.7)	196(11.2)	43(2.5)
Purchase food on credit	323(18.5)	333(19.1)	636(36.5)	387(22.2)	64(3.7)
Harvest immature crops	979(56.2)	267(15.3)	276(15.8)	172(9.9)	49(2.8)
Consume seed stock held for next season	1088(62.4)	220(12.6)	229(13.1)	164(9.4)	42(2.4)
Send household members to eat elsewhere	1386(79.5)	151(8.7)	127(7.3)	58(3.3)	21(1.2)
Send household members to beg	1549(88.9)	109(6.3)	60(3.4)	19(1.1)	6(0.3)
Limit portion size at mealtimes	391(22.4)	219(12.6)	458(26.3)	435(25.0)	240(13.8)
Restrict consumption by adults	1552(89.0)	78(4.5)	56(3.2)	29(1.7)	28(1.6)
Ration the money you have and buy prepared food	1402(80.4)	125(7.2)	121(6.9)	69(4.0)	26(1.5)
Reduce the number of meals eaten in a day	295(16.9)	262(15.0)	538(30.9)	399(22.9)	249(14.3)
Skip eating for the entire day	887(50.9)	407(23.4)	326(18.7)	113(6.5)	10(0.6)

As shown in Figure 3, the most commonly used coping strategy was "relying on less-preferred and less-expensive food," followed by "reducing the number of meals eaten in a day," "purchasing food on credit," and "limiting portion sizes at mealtimes" "Restriction of adults' consumption so that children could eat" and "sending household members to beg" were less commonly employed strategies. This is in line with the findings reported by a study done in South Africa (12) and the Rwanda Comprehensive Food Security and Vulnerability Analysis (CFSVA) 2015 (13).

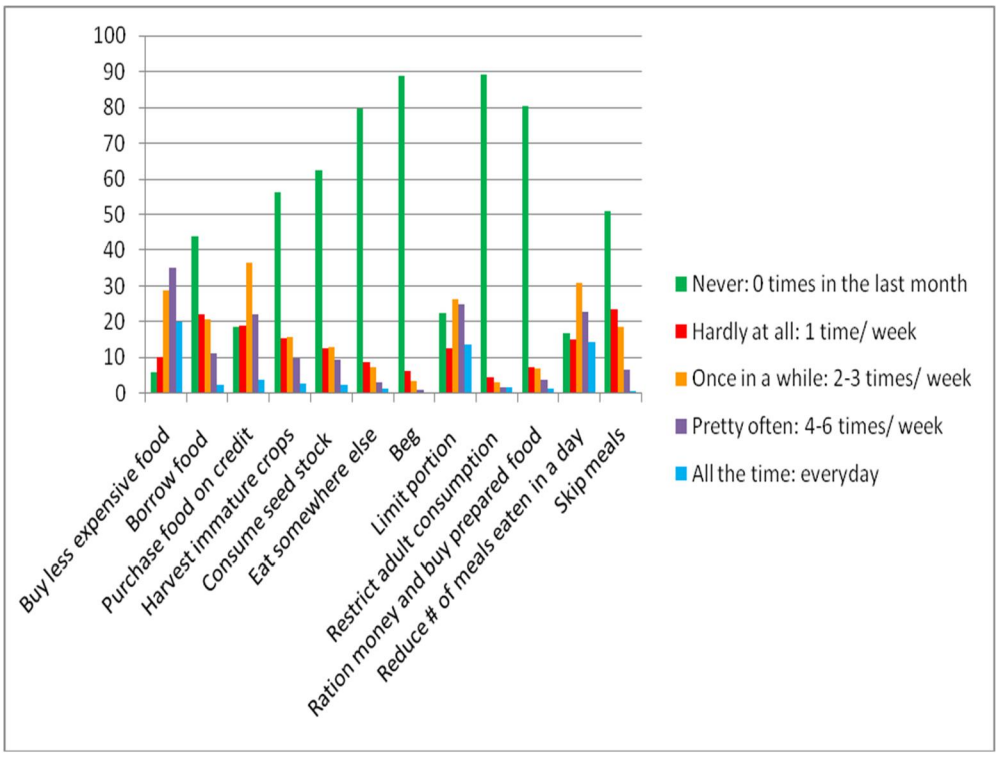


Figure 3: Utilization of different coping strategies for the lack of food or money to buy food in the 30 days preceding the survey

Households were classified according to their CSI scores. Low CSI scores indicate less food insecurity (i.e., more food secure). The minimum CSI score was 0, while the maximum was 175, with a mean of 26.88 (Table 12). CSI scores varied between the two Kigali Province districts (Kicukiro and Nyarugenge) and the other districts. For example, Kicukiro had the lowest mean CSI score of 19.9 (SD: 14.6), while Nyabihu had the highest mean CSI score of 33.1 (SD: 26.2).

Table 13: Household average coping strategies index score

District	N	Minimum CSI score	Maximum CSI score	Mean CSI score	Standard deviation
Nyarugenge	272	0	88.5	23.4	17.6
Kicukiro	200	0	82.5	19.9	14.8
Nyabihu	361	0	175	33.1	26.2
Rwamagana	298	0	101.5	28.8	21.6
Kayonza	329	0	108	25.5	18.4
Ngoma	283	0	156.5	26.5	21.4
Overall	1743	0	175	26.88	21.18

All households that had used one or more coping strategies were divided into three equally large groups (terciles =low, medium, and high CSI scores) depending on their CSI score. As shown in Figure 4 and in line with other food-security measures, the district with the largest proportion of households with high CSI scores, that is, households relying on several different coping strategies several times a week were Nyabihu, where 47% of all households had to cope with food shortages in the week before the survey. In contrast, Kicukiro had the fewest households with high CSI scores (24%). Many households with low CSI scores (that specifically tended to rely on less-preferred and less-expensive foods and to limit portion sizes at mealtimes)were found in Kicukiro (44%) and Nyarugenge (41%), while relatively few households with low CSI scores were found in Nyabihu and Kayonza (28% and 29%, respectively).

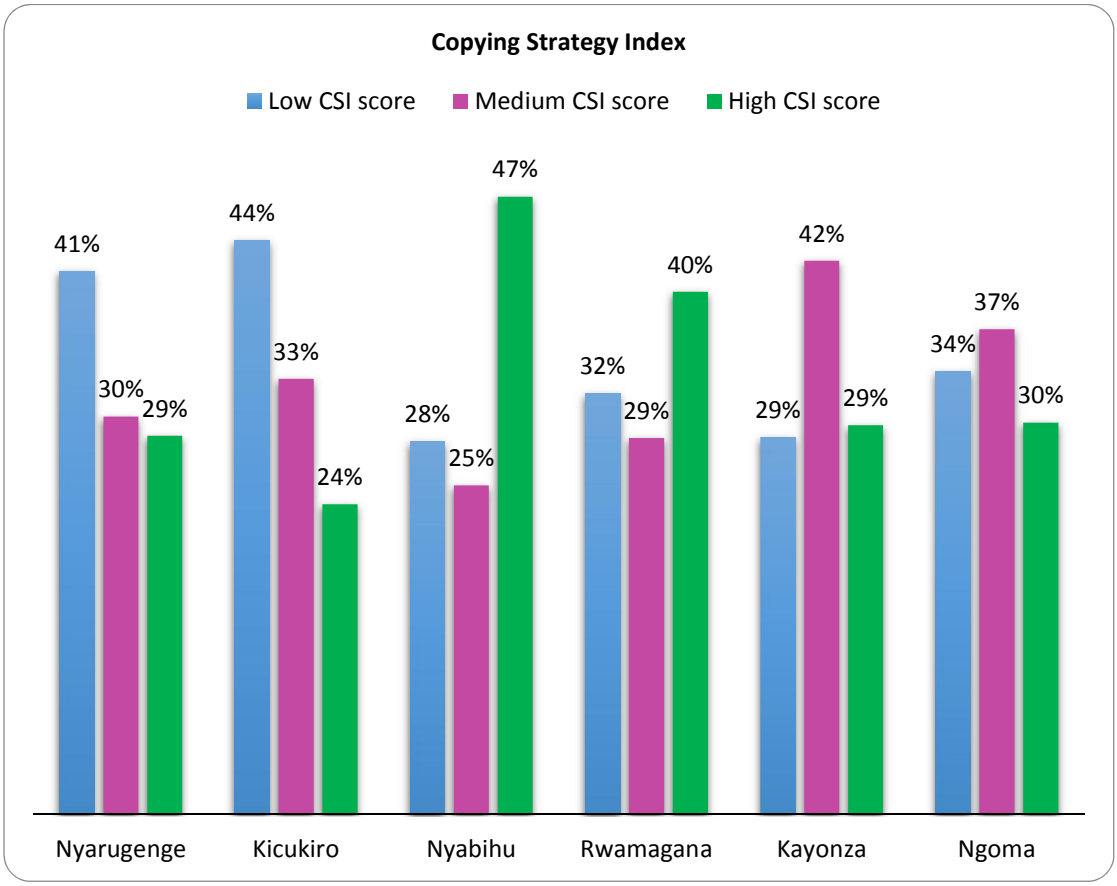


Figure 4: Distribution of households by coping strategies index (CSI) tercile

5.3.3 Dietary diversity among women

Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods. It is also a proxy for the nutrient adequacy of the diet of individuals. WDDS is a qualitative recall of all foods consumed by women during the previous 24-hour period. Each woman involved in the study was asked to recall all the dishes, snacks, or other foods that she had eaten during this period, regardless of whether the food was eaten inside or outside the home. WDDS were calculated based on the number of different food groups as proposed in the

Food and Agriculture Organization guidelines for measuring household and individual dietary diversity:(1) starchy staples[1], (2) dark green leafy vegetables, (3) other vitamin A–rich fruits and vegetables[2],(4) other fruits and vegetables[3],(5) organ meat,(6) meat and fish,(7) eggs,(8) legumes, nuts, and seeds, and (9) milk and milk products. The maximum of number of food groups that could be consumed was nine. The food items most commonly consumed by women in the *Gikuriro* districts were starchy staple foods and legumes, nuts, and seeds (Figure 5).

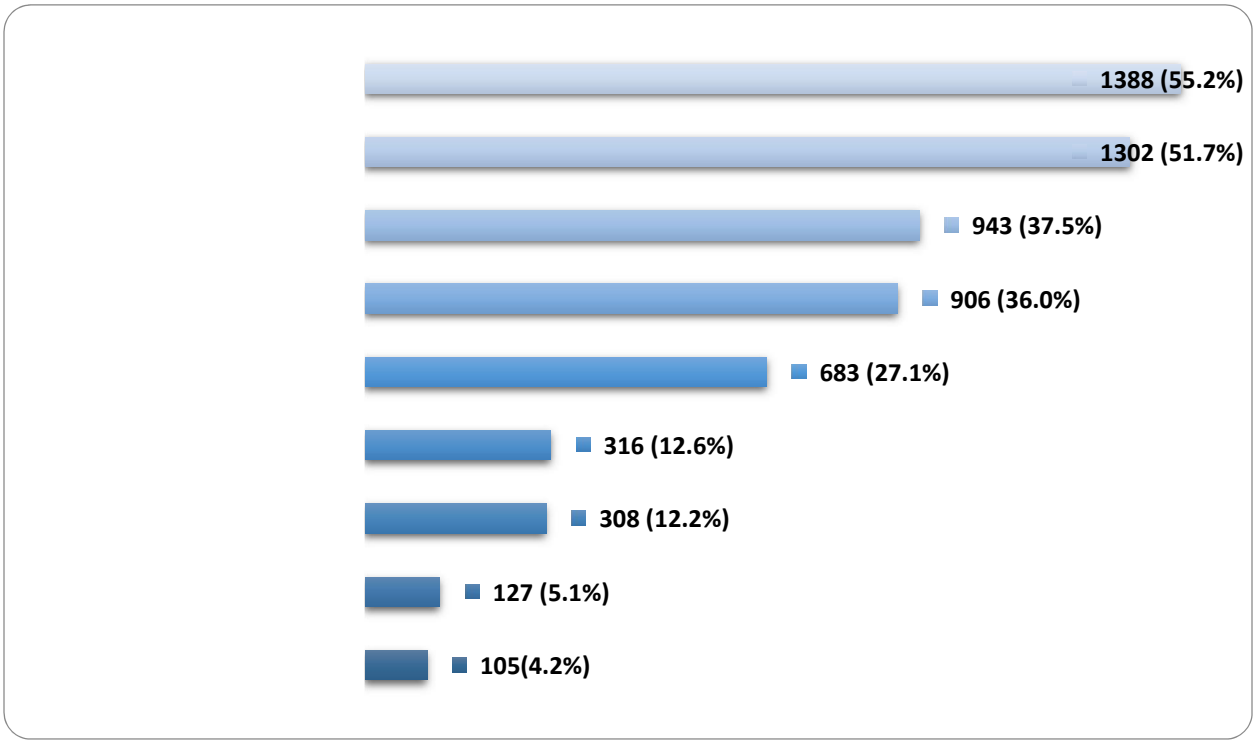


Figure 5: Women's consumption of different food groups on the day before the survey

Animal food products (meat, milk, eggs, and fish) are rich sources of proteins, which provide energy and serve as the building blocks of the body. Their consumption by women showed clear geographical differences between the districts. Nyabihu, Kayonza, and Ngoma had a low percentage of women who consumed animal food products, while the Kigali Province districts (Kicukiro and Nyarugenge) had a higher percentage of women who consumed protein-rich foods (Table 13).

[1]The starchy-staples food group is a combination of cereals and white roots and tubers.
[2]The other vitamin A–rich fruit and vegetable group is a combination of vitamin A–rich vegetables and tubers and Vitamin A–rich fruit.
[3]The other fruit and vegetable group is a combination of other fruits and other vegetables.

Table 14: Food group consumption

Food group	Nyarugenge n(%)	Kicukiro n(%)	Nyabihu n(%)	Rwamagana n(%)	Kayonza n(%)	Ngoma n(%)	Total N(%)
Starchy staples	252(59.9)	246(60.2)	247(58.5)	221(53.1)	217(50.5)	205(48.9)	1388(55.2)
Dark green leafy vegetables	202(48.0)	196(47.9)	189(44.8)	140(33.7)	76(17.7)	103(24.6)	906(36.0)
Other vitamin A–rich fruits and vegetables	131(31.1)	165(40.3)	136(32.2)	112(26.9)	70(16.3)	69(16.5)	683(27.1)
Other fruits and vegetables	199(47.3)	197(48.2)	122(28.9)	160(38.5)	142(33.0)	123(29.4)	943(37.5)
Organ meat	26(6.2)	34(8.3)	3(0.7)	29(7.0)	18(4.2)	17(4.1)	127(5.1)
Meat and fish	64(15.2)	95(23.2)	8(1.9)	55(13.2)	25(5.8)	61(14.6)	308(12.2)
Eggs	17(4.0)	49(12.0)	5(1.2)	19(4.6)	9(2.1)	6(1.4)	105(4.2)
Legumes, nuts, and seeds	258(61.3)	237(58.0)	167(39.6)	221(53.1)	217(50.5)	202(48.2)	1302(51.7)
Milk and milk products	58(13.8)	91(22.3)	48(11.4)	49(11.8)	30(7.0)	40(9.6)	316(12.6)

We found that 46% of women had low dietary diversity (≤3 food groups), 37% had medium diversity (4 or 5 food groups), and 17% had high dietary diversity (≥6 food groups; Figure 6).

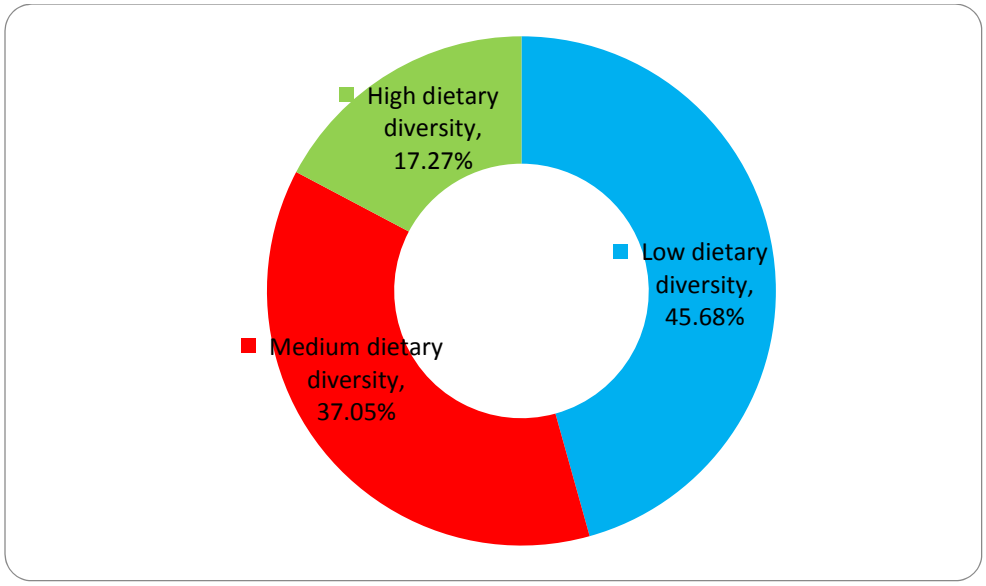


Figure 6: Dietary diversity among women

WDDSs were calculated by summing the number of food items from the nine food groups that the women had consumed in the previous 24 hours. The purpose of individual dietary diversity scores is to reflect the nutritional quality of the diet, with higher scores reflecting better nutritional quality. Because of this, it is recommended to use the mean scores or distribution of scores for setting program targets or goals (14). We found that, women in the Kigali Province districts had the highest WDDSs (Kicukiro, 4.9; Nyarugenge, 4.3), while women in the Eastern Province districts had the lowest WDDSs (Kayonza, 3.2; Ngoma, 3.3; Figure 7).

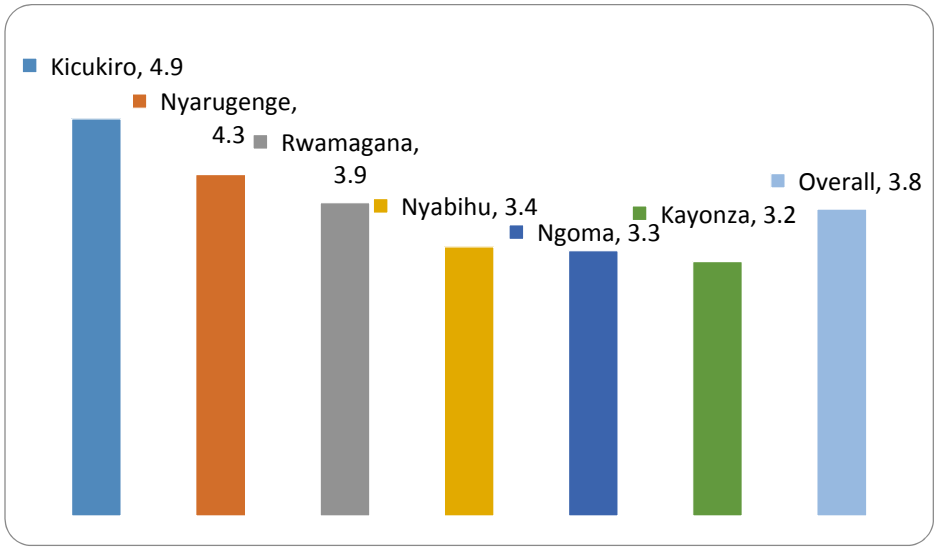


Figure 7: Mean dietary diversity scores among women

5.3.4 Food consumption score

The food consumption score (FCS) is a food-security indicator that is used widely across different countries and contexts. In this survey, respondents were asked which food items had been consumed in their households in the past 7 days out of a comprehensive list of food items. The FCS combines dietary diversity, frequency of consumption (number of days on which each food group is consumed), and the relative nutritional importance of different food groups. Scores are divided into three groups as follows: 0–21.4, poor food consumption; 21.5–35, borderline food consumption; and >35, acceptable food consumption. We found that 60%of households had poor food consumption (severely food insecure), 18%had borderline food consumption (moderately food insecure), and 22% percent had acceptable food consumption (food secure; Figure 8).The majority of households (69%) in Nyabihu had poor food consumption (Figure 9). Compared to other districts, Kicukiro had a high proportion of households (38%) with acceptable food consumption.

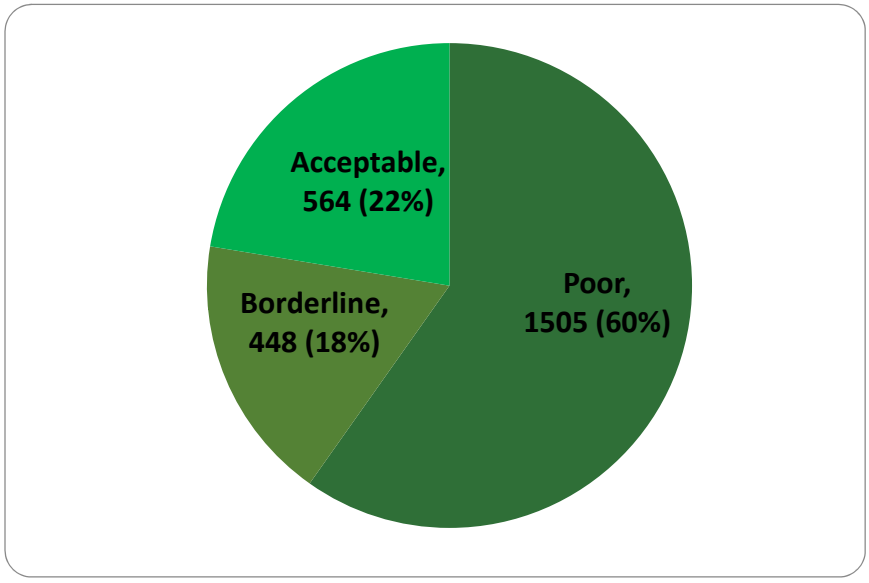


Figure 8: Overall food-consumption status

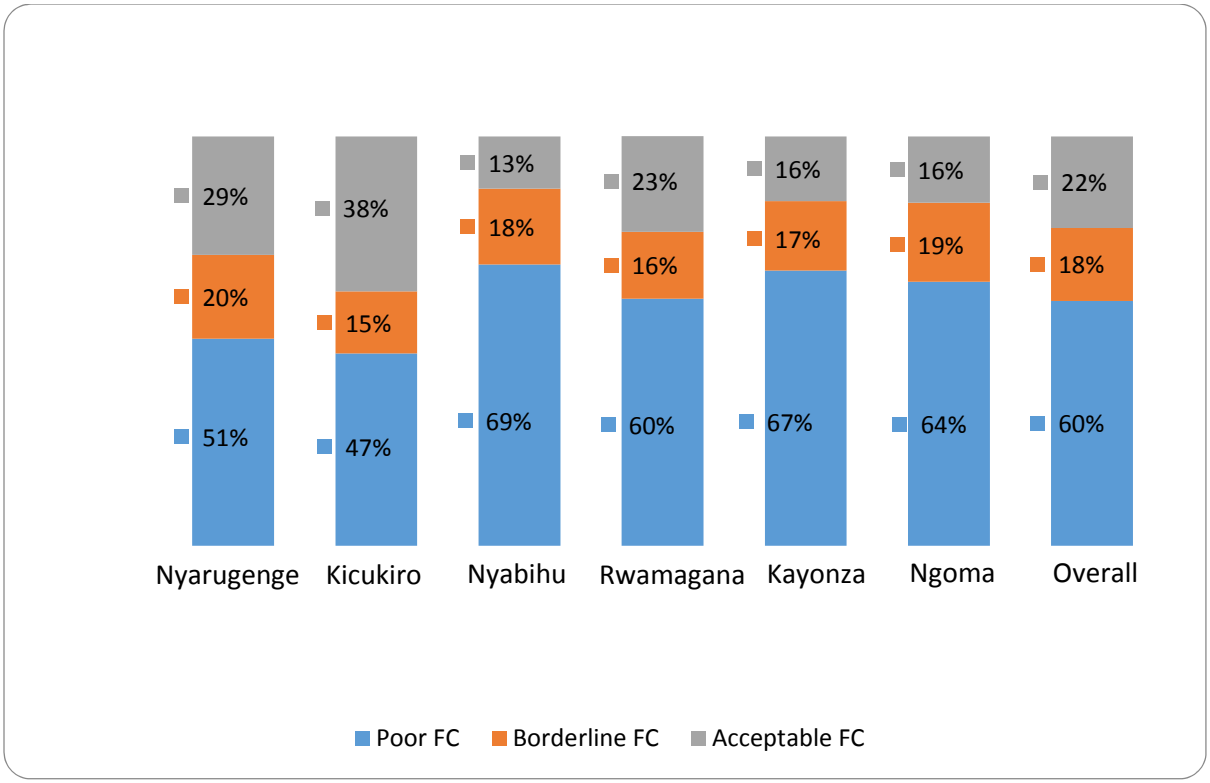


Figure 9: Food consumption (FC) scores by district

5.4 Knowledge on Infant and Young Child Feeding

5.4.1 Knowledge on feeding infants (0–6 months)

The overall awareness of biological mothers or other caregivers about feeding young infants (0–6 months) was low (46.8%). The difference in feeding knowledge among the districts was not large; however, the lowest awareness was found in Kayonza (38.8%) and Ngoma (40.5%). The main channel for getting information was the radio (46.8%), followed by local leaders/CHWs (15.9%). Among biological mothers or other caregivers having knowledge on infant feeding, the majority knew about the benefits of breastfeeding for babies (80%), while 12% didn't. However, the benefits that the mother gains by feeding the baby were not widely known (35.9%); this level was lowest in Ngoma (28%) and Nyabihu (27.7%).

The qualitative findings confirmed the quantitative figures, and 77 participants reported that this issue was the main challenge towards appropriate infant feeding. Many health service providers confirmed that knowledge about infant feeding was still a challenge, especially, among low socioeconomic households, as most of the adults in such households are cultivators/laborers.

"*When we look at those children with malnutrition or when we ask, we realize that they are those who frequently fall sick, those coming from families who have poor knowledge on how to prepare complete*

meals and how to care for the child," said a staff member from Rwamagana.

There is another issue of infants who are fed by housemaids who are not skilled in infant feeding, when the parents are busy. A male FGD participant from Nyabihu said "*Here, I can say is that for some, it is possible because all are not on the same economic level, but there are some barriers linked to ignorance and a busy schedule of parents like for civil servants who go for work and leave their children with housemaids whose care to children is not good.*"

A female FGD participant from Ngoma said *"What I can add is that insufficient knowledge about a balanced diet is another barrier because a woman can have different types of food but don't know how to combine them in order to prepare a balanced diet. For example, if she has green banana, she may think that she doesn't need like small fishes, groundnuts, vegetables…"*

Due to a lack of knowledge, some households sell crops that are rich in nutrients required by infants and buy other items that families need most. Misconception is a big issue here. *"According to me, the general cause of malnutrition is about misconception or lack of knowledge towards appropriate feeding. I can prefer selling milk and eggs instead of giving them to my children thinking that money is important than my children's life. Misconception is a big problem*," said a female FGD participant from Ngoma.

The lack of skills/knowledge and ignorance and poverty were confirmed by almost all respondents (general population, local implementing partners, key informants) as the main causes leading to malnutrition. For instance, a local implementing partner from Ngoma said *"There are many causes, but the first is the lack of sufficient knowledge about nutrition, lack of knowledge about how to prepare a balanced diet as well low socioeconomic status. Or the food may be available, but how to prepare them to make a balanced diet becomes a problem for them."*

Another challenge was the dependence on the market since households had to complement what they harvested with other items from the market. The only big challenge here was the lack of the needed food items in the market or the lack of money to buy these items for some households. *"Foodstuff is expensive. We used to eat only 1000 RwF per day, but these days, foodstuff is expensive and that money is not enough per day. Prices on market keep increasing day after day, and while our income does not increase,"* said a female FGD participant from Nyarugenge.

"The barrier is mainly poverty. Some may not be able to get fruits and porridge. Yeah, let's say a child is 6 months old. At that age, a child needs fruits and supplementary food. However, because of poverty, the parent does not provide food supplement, and as a result, the child is malnourished/stunted. The child looks low weight compared to his/her age," said a female FGD from Nyabihu.

5.4.2 Knowledge on feeding young children (6–23 months)

The awareness of biological mothers or other caregivers about complementary feeding was low, and only 45.2% of biological mothers or other caregivers had received any information about complementary feeding. The level of awareness about complementary feeding was lowest in Kayonza (39.4%) and Ngoma (38.2%). For biological mothers or other caregivers who were aware of complementary feeding, the main sources of information were the radio (33.2%), community leaders/CHWs (19.3%), and ANC visits (17.2%). Many mothers knew about good sources of food for dietary diversity (e.g., ways to enrich porridge), and only 15% of all biological mothers or other caregivers interviewed did not know how to make a diverse diet for their babies. Knowledge on dietary diversity was lowest in Ngoma (20.7%) and Nyarugenge (22.4%).

The qualitative assessment showed that poor knowledge and poverty remain the main challenges. Poor knowledge was reported by 77 participants, poverty was mentioned by 107 participants, and poor complementary feeding practices were reported by 46 participants. These findings strongly support the quantitative findings about the lack of knowledge on complementary feeding.

Although 121 participants highlighted the key role CHWs played in nutrition intervention through their hard work in community sensitization, there is still a need to support their initiatives by putting more effort into public nutrition education and economic strengthening for those who cannot afford appropriate foods "*Thank you. In our sector, Mutenderi, as my fellow was saying, we have enough food stuff; the only challenge we have is poor knowledge on how to prepare them appropriately, where one can go to the market and buy what is not very needed instead of buying what is needed for complete meal preparation. On the other side, there are people who are struggling to get food, but at least, they have where to find them. So, in general, the only challenge for those pregnant or lactating mothers is poor cooking practices,*" said a male FGD participant from Ngoma.

Forty-five participants recommended the kitchen-garden initiative as key in alleviating malnutrition at the community level; 238 supported sensitization, which was the most recommended intervention; 23 mentioned that once family planning and contraceptive prevalence increase, families will be able to nourish their members; 26 needed income-generating activities, and 170 recommended the involvement of males/husbands in infant nutrition programs at the household level. For instance, in one FGD in Ngoma, all females said that infant feeding was considered a woman's business. "*Men? They don't do this. They say that it is a business of women. Those who are involved are very few."*

Later on, these ladies said this about male involvement: "*Let me use 'Akagoroba k'ababyeyi 'in explaining this. Actually, men are interested in being involved in Akagoroba k'ababyeyi, because there, men and women meet and discuss many issues, including nutrition, household development issues, and they try to resolve some conflict between them. Due to Akagoroba k'ababyeyi, many men changed their behaviors toward household responsibilities."*Positive masculinity is a key in infant feeding practices. There is a need to change what people consider as a "true man," which is actually the real source

of conflict, and infants are the first victims.

5.5 Infant and Young Child Feeding Practices

According to Rwanda's CFSVA 2015(13) ,infant and young child feeding practices were reported to be poor in Rwanda, with only 15%of children meeting the minimum acceptable diet. In this study, we found similar results in the six *Gikuriro* districts: only 6% of children met the minimum acceptable diet. Below is the detailed information about some indicators of infant and young child feeding that we were able to calculate with the available data.

5.5.1 Early initiation of breastfeeding

Several studies have shown that early initiation of breastfeeding (within the first hour of life) reduces the risk of neonatal mortality(15–17). Women are encouraged to breastfed their children in the first hour after birth because of its importance for the mother and child. For the mother, it stimulates breast-milk production and helps to reduce postpartum blood loss by facilitating the secretion of oxytocin, which helps in uterine contraction. For the child, the first breast milk—or colostrums—is highly nutritious. The early breast milk provides essential nutrients as well as antibodies to boost the baby's immune system and protect the newborn from diseases. Figure 10 shows the percentage of children born in the 2 years preceding the survey who were put on the breast immediately or within one hour of life in the *Gikuriro* districts. More than 90% of children were breastfed within one hour of birth and the remaining were put to breast after one hour. The highest percentages of children breastfed within one hour were found in Kicukiro (97.9%), Nyabihu (96.7%), and Nyarugenge (94.5%).

The qualitative assessments confirmed that there is a high level of awareness about early initiation of breastfeeding. All respondents confirmed that they were aware that a newborn should be breastfed immediately after birth. For instance, a service provider from Kicukiro said "*Yes, they do that for sure. They are fully aware of immediate breastfeeding.*" This was even confirmed by CHWs. "*When I come back on the question you asked about the breastfeed women, we know well that woman after giving birth immediately breastfeed her child, for the child to get the yellow breast milk that for him/her to gain energy,"* said a CHW from Rwamagana.

One lady from Nyabihu explained the importance of breastfeeding initiation: "*Some mothers breastfeed the baby after delivery. The women feel happy because they know breastfeeding colostrum is essential and necessary for the baby's health.*"

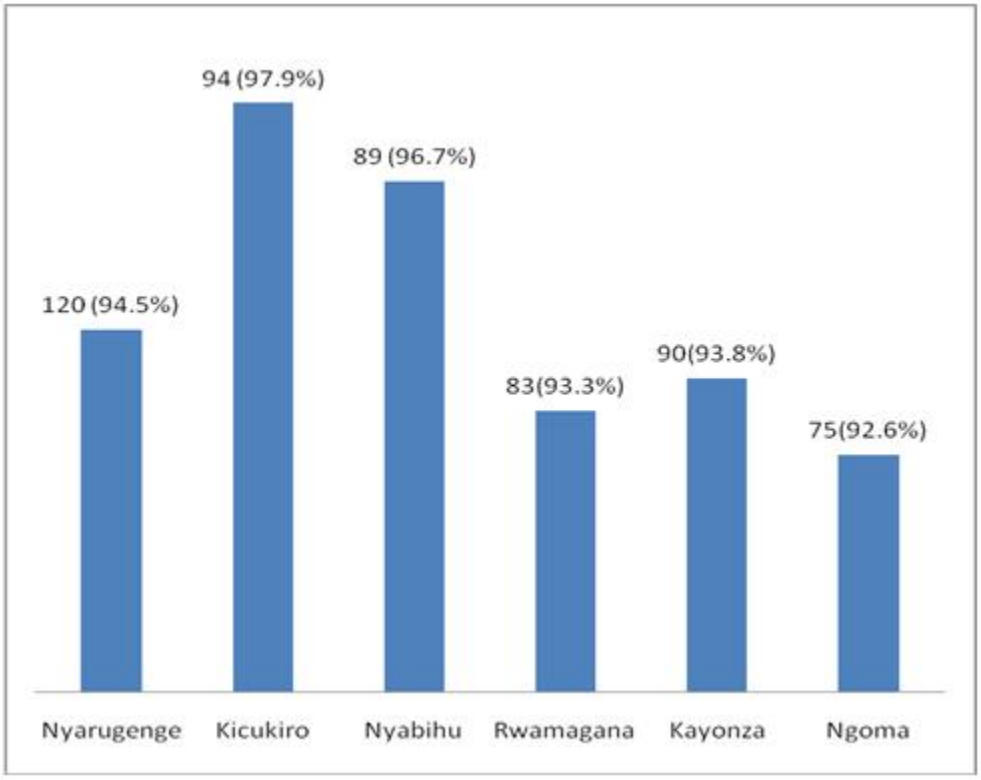


Figure 10: Children born in the 2 years preceding the survey who were put on the breast immediately or within one hour of life

5.5.2 Exclusive breastfeeding

Exclusive breastfeeding in the first 6 months of life saves lives. Breast milk contains all of the nutrients necessary during the first 6 months of life (15). Generally, exclusive breastfeeding during the first 6 months after birth is widely practiced in Rwanda. According to RDHS 2014–2015[8], 87% of under 6-month-olds are exclusively breastfed (2). Almost the same proportion of exclusively breastfed children (85.6%) was found in the *Gikuriro* districts (the slight difference in the two percentages may be due to the fact that we only gathered this data for children aged under 5 months; Figure 11).

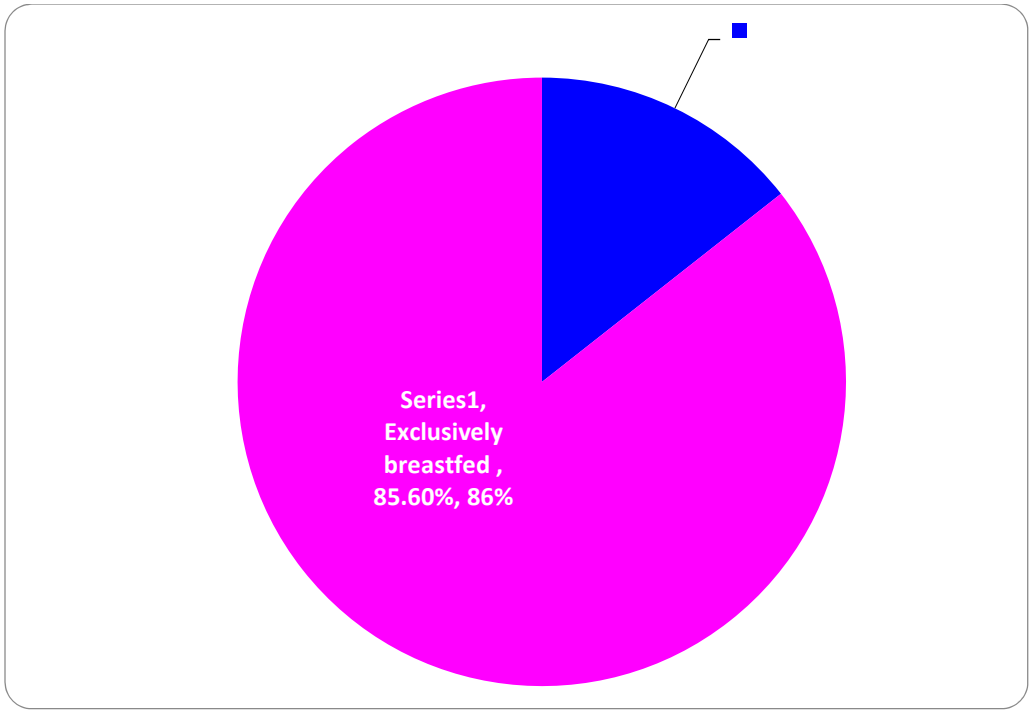


Figure 11: Prevalence of exclusive breastfeeding during the ages of 0–5 months

The qualitative assessment showed that many respondents, particularly CHWs, had the necessary knowledge about exclusive breastfeeding and its importance as well as knowledge of when complementary feeding should be introduced. "*After a child is born, they breastfeed him/her up to the time he is 6 months old. When he has reached to 6 months, they give him breastfeeding help that consists of a balanced diet. Then, he reaches to 24, he is removed on breastfeeding and continues to eat a balanced diet in order his life to continue being well,*" responded a CHW from Nyabihu.

Most respondents were aware of the importance of the first 1000 days of life, and the corresponding package of services with a focus on children. They reported that breastfeeding should continue until at least 2 years. However, they said that breastfeeding depends on the mother's nutritional status. "*Appropriate breastfeeding depends on women's nutrition. If women do not eat appropriately, they could not exclusively breastfeed their babies up to 6 months,*" said a female FGD participant from Nyarugenge. A CHW from Kicukiro emphasized this in these words: "*What I can say is that a child breastfeeds on what her mother has taken in. When a mother is bad off, and she doesn't feed on well, when a child is breastfed, she (mother) becomes worse. We still have those people in the twenty-first century.*"

The fact that all women do practice exclusive breastfeeding may be due to several factors/reasons. Culture plays a role in breastfeeding practices; some communities consider that breastfeeding should be stopped when a woman becomes pregnant again. "*Usually in Rwandan culture, when the*

mother is not pregnant, she breastfeeds her baby, maybe not 100%, but they do," said a health service provider from Kicukiro.

5.5.3 Child food consumption

For children aged 6–23 months, the caregiver was asked what the child had consumed in the 24 hours before the survey. The most common food items consumed by children belonged to the grains, roots, and tubers group (341, 77.3%), followed by the legumes and nuts group (250, 57%) and the vitamin A–rich fruits and vegetables group (216, 48.9%; Figure 12).

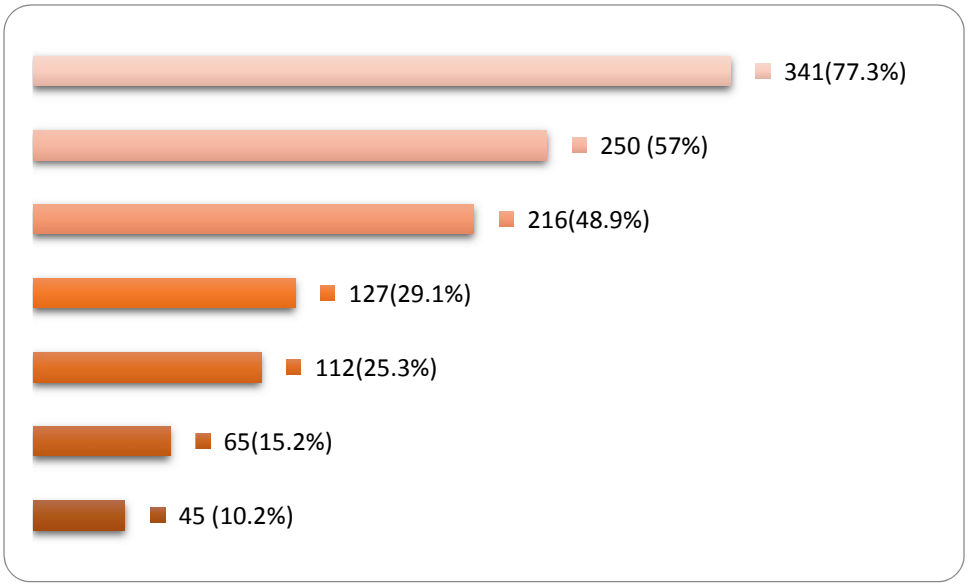


Figure 12: Food items consumed by 6–23-month-old children in the 24 hours before the survey

5.5.4 Minimum Dietary Diversity

The Minimum Dietary Diversity (MDD) is the proportion of children aged 6–23 months who receive foods from four or more food groups from a total of seven food groups. To calculate this value, a seven–food-group score was created using the formula found in "Indicators for assessing infant and young child feeding practices: measurement guidelines"(18). The seven food groups were as follows: (1) grains, roots, and tubers; (2) legumes and nuts; (3) dairy products (milk, yogurt, cheese); (4) flesh foods (meat, fish, poultry, and liver/organ meats); (5) eggs; (6) vitamin A–rich fruits and vegetables; and (7) other fruits and vegetables.

Based on the diversity of food consumed among children aged 6–23 months, the minimum dietary diversity was calculated. The results showed that only 29% of children in this age group achieved the minimum dietary diversity (Figures13 and 14).

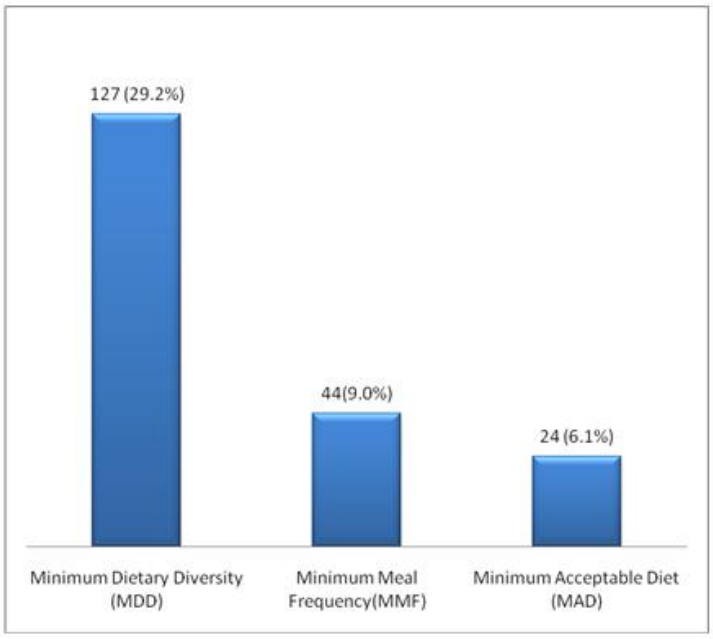


Figure 13: Percentage of children meeting the minimum dietary diversity, minimum meal frequency, and minimum acceptable diet

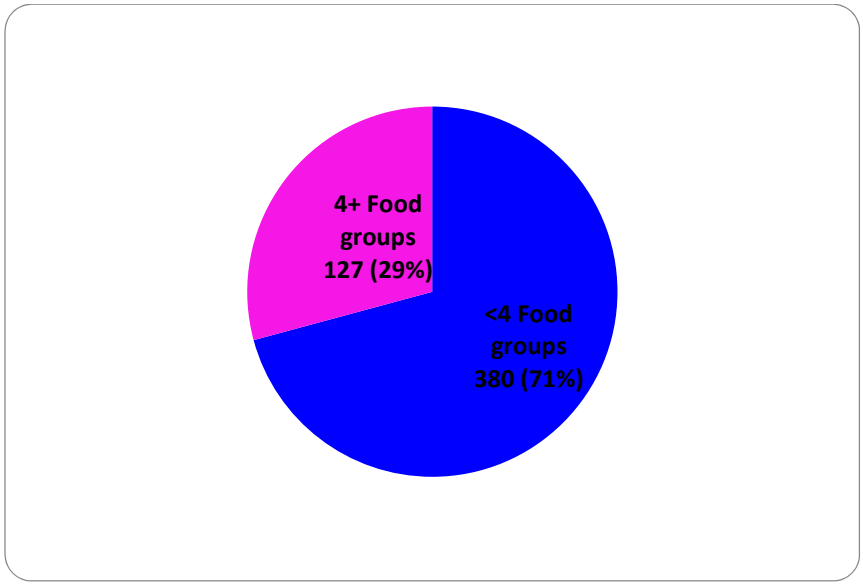


Figure 14: Children aged 6–23 months who received the minimum dietary diversity

The minimum dietary diversity was calculated at district level. The lowest diversity (almost 80%) was observed in Kayonza and Nyabihu (Figure 15).

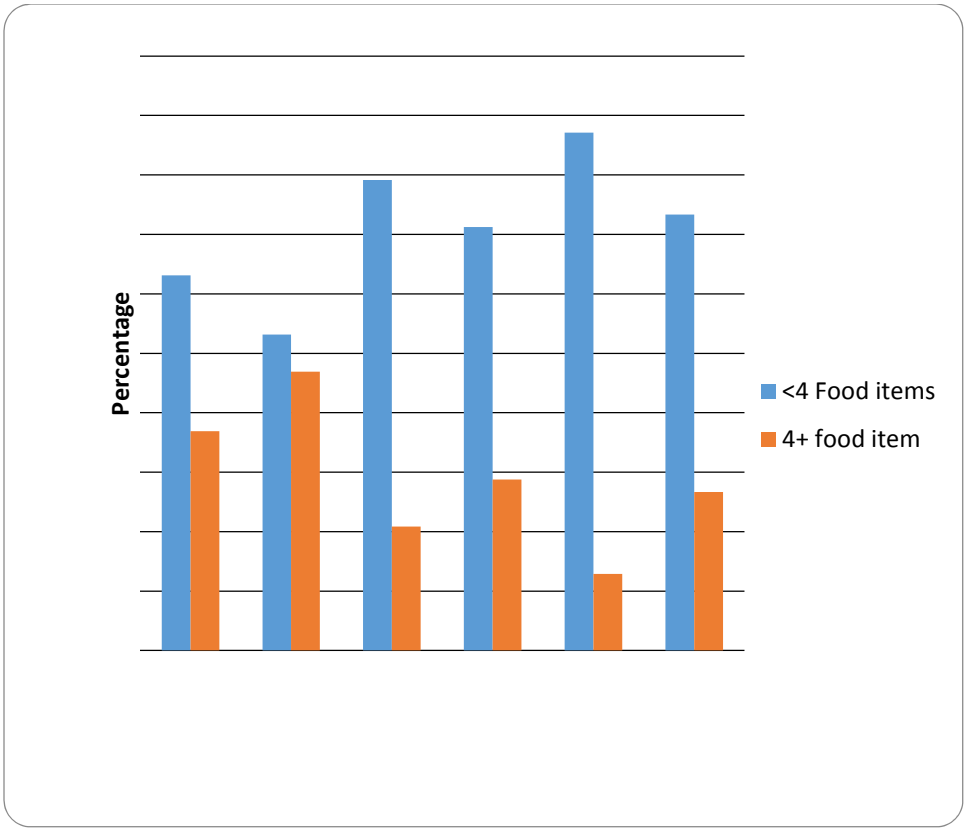


Figure 15: Percentage of children aged 6–23 months receiving the minimum dietary diversity by district

5.5.5 Minimum meal frequency

Minimum meal frequency is intended to capture information on the frequency of feeding solid, semi-solid, or soft foods. This indicator represents the proportion of children aged 6–23 months who receive solid, semi-solid, or soft foods the minimum number of times or more in a day. Based on the 2015 CFSVA report, we used three times per day as the minimum meal frequency for 9–23-month-oldchildren. Due to the small number of observations, we could not be able to calculate the minimum meal frequency using four meals per day for 6–23-month-old children. Less than 9% of children received food three or more times a day (Figure 16).

The qualitative findings revealed that having enough food to ensure the recommended meal frequency was an issue, and this was reported by 38 participants. "*Mothers hardly find food and eat once a day a non-balanced diet, as they should eat at least three times a day,*" stated an ASOC from Rwamagana.

Additionally, the issue of a low level of knowledge on infant feeding was highlighted. "*Our problem here in rural area, women do not know how to prepare children's food,*" quoted a male FGD participant from Rwamagana.

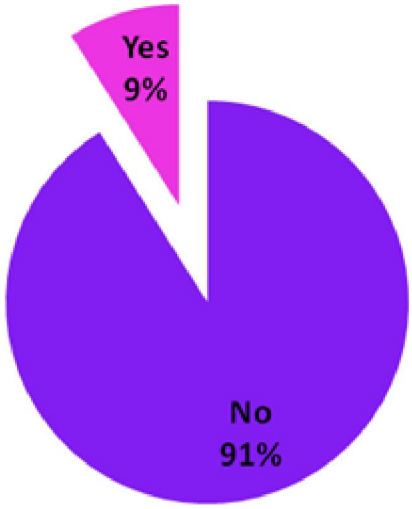


Figure 16: Children aged 9–23 months for whom the minimum meal frequency was achieved

5.5.6 Minimum acceptable diet

We determined the proportion of children aged 6–23 months who received the minimum acceptable diet (apart from breast milk). The minimum acceptable diet was defined as one that met both the MDD (consumption of four or more of the seven food groups) and minimum meal frequency (two or more meals/day for 6–8-month-olds, three meals per day for 9–23-month-olds. We found that only one in fifteen children (6%) met the criteria for a minimum acceptable diet (Figure 17).

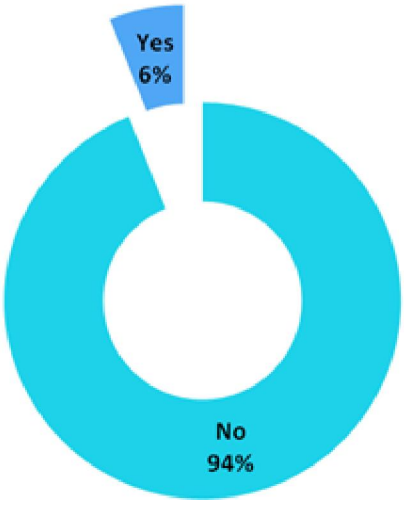


Figure 17: Children aged 6–23 months who met the criteria for the minimum acceptable diet (apart from breast milk)

5.6 WASH Activities

5.6.1 Community Health Clubs

There are two principles that can be used in hygiene promotion and behavior change communication. First, people must be exposed to knowledge through any communication medium such as radio, TV, printouts, and meetings. Second, to ensure sustainable behavior change, people must participate in dialogue sessions and discussions concerning matters of hygiene and sanitation. This will ensure maximum understanding and a capacity to take proper decisions. It is in this context that CHCs have been chosen as the main disseminators of behavior-change communication. This study revealed that the awareness of CHCs in villages is still low. Only 831 (33%) respondents were aware of the existence of CHCs, and only 116 (14%) had participated in dialogue sessions at CHCs (Figure 18). This is different from what the authorities say. "*We have trained and have well-performing hygiene clubs, which have committees in villages. Those clubs help us in teaching each other about washing of hands and other hygienic practices in their households. We put our effort there, and they give us monthly report, and this helps us to know where more emphasis is needed than anywhere else,"* said a staff member from Nyabihu.

With regards to qualitative findings, the understanding of WASH benefits was generally satisfactory in all districts. Many communities had formed CHCs that regularly sensitized people to WASH activities, though their activities were not as intensive as when they were first formed, since the partners who had initiated them had left the area without a sustainability plan.

"*Each club has a committee with seven members, and at times, you could see three important members, among of them being the president and vice-president, leaving the clubs. In addition, the partner who helped us to initiate those clubs went, and then, there was no more follow-up of activities. The district and ourselves became like dormant,*" said a staff member from Kicukiro.

Key informants recommended close follow-up of these clubs via supervision and sustainability plans. "*In villages, CHCs are there but not functioning because there was no follow-up. You may find hygiene committees but not working due to lack of supervision,*" said a staff member from Ngoma. The following issues in the running of CHCs were highlighted: a lack of ownership by CHC members, lack of training to operate clubs (this was claimed by almost all CHC and ASOCs in the FGDs), limited operation funds/budget and financial incentives for members who have other work to do, insufficient transportation means, logistical difficulties, and lack of close follow-up.

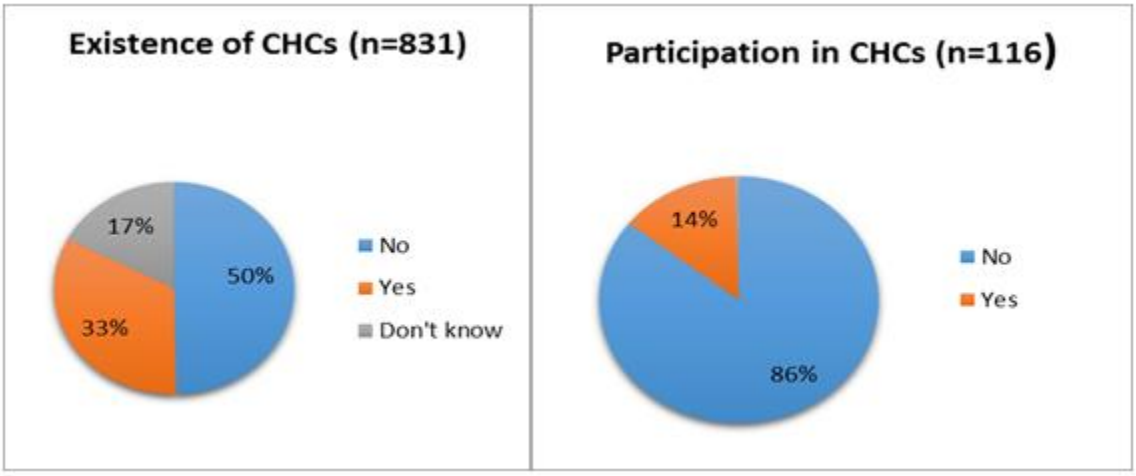


Figure 18: Percentage of respondents who were aware of and participated in community health clubs (CHCs)

5.6.2 Personal hygiene

5.6.2.1. Handwashing by caregivers before preparing food

The majority (1985, 88.9%) of respondents reported that they understood that diseases could be caused by poor hygiene and sanitation, and that hand washing with soap and water was important to prevent diseases caused by poor hygiene. Nevertheless, hand washing before preparing food was practiced by only 1.8% of caregivers, and only 0.8% washed their hands after handling their child's feces or cleaning their child's bottom (Figure 19). Furthermore, only 127 (6.2%) respondents washed their hands before eating, while 21(1%) respondents washed their hands before feeding or breastfeeding their children. Washing hands after handling garbage, sharing the same bowl/basin of water, and drying their hands on their clothes were reported by 2 (0.1%), 1448 (70.5%), and 131 (11.8%) respondents (see Appendix 3).

The qualitative assessment showed that very few respondents reported washing their hands before and after preparing food, and very few knew the consequences of not engaging in this practice. *"We wash hands before breastfeeding, before preparing food,"* said a female participant from Nyabihu. *"When she does not wash hands before preparing food and breastfeeding the baby, all things she is doing get dirty, and there are microbes in what she eats, which may cause diseases,"* reported a CHW from Kayonza.

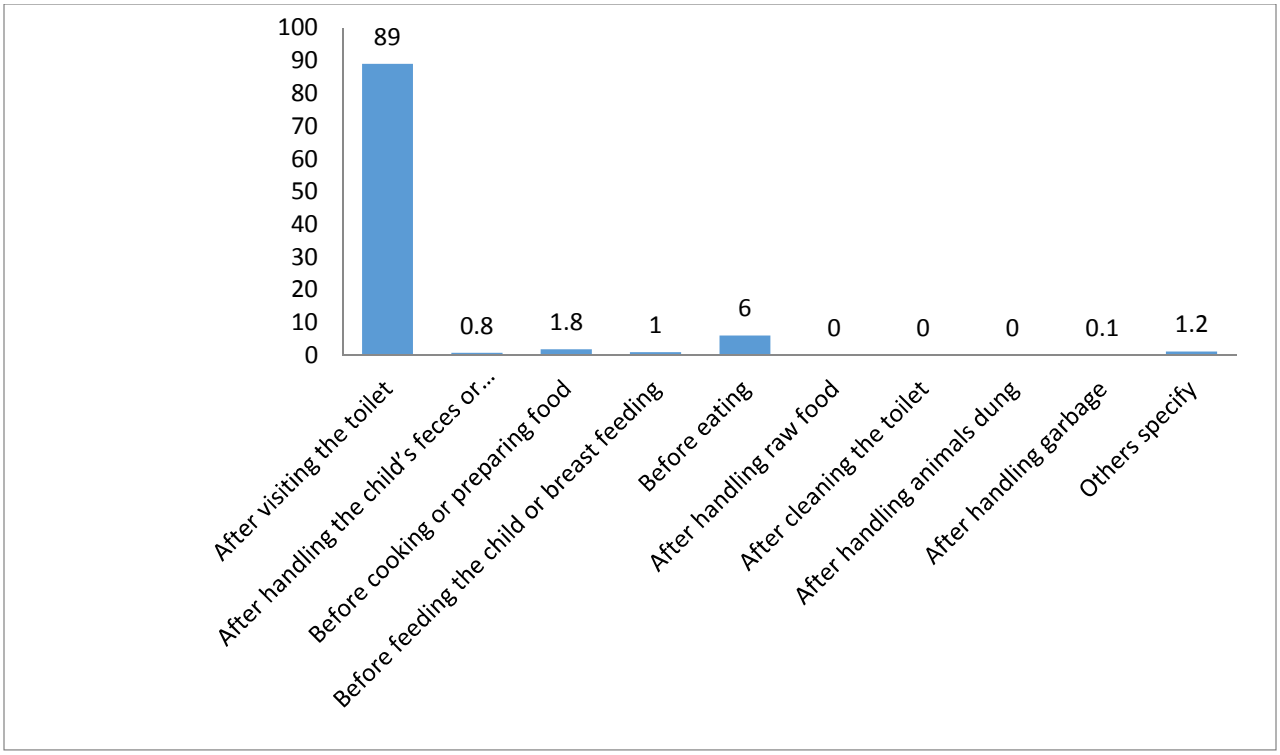


Figure 19: Distribution of handwashing frequencies at key moments

5.6.2.2. Safe disposal of stools of children aged under 3 years

Child stool disposal is a key WASH indicator. Unsafe stool disposal may cause infectious diseases. In the *Gikuriro*districts, most respondents (90%) safelydisposedthe feces of children who couldn't yet use the toilet (under 3 years old). However, there still remained a not-negligible number of households(10%) that used unsafe means of child stool disposal, like throwing feces in garbage, bushes, open places, etc (Figure 20). This shows that child stool disposal is still a concern, especially, when caregivers throw children's feces in the garbage. The study also revealed that 284 (11.3%) respondents disposedthe water used to cleanse the child's bottomafter defecation anywhere on the ground (Appendix 3). Moreover, 333 (13.2%) children aged under 3 years were reported to defecate anywhere on the ground. This is the main environment pollutant and source of infections.

In the qualitative assessment, many participants stated that open defecation is no longer an issue. However, some participants reported otherwise."*We can't approve it because sometimes while walking you may meet where they pooped because in those small roads no many passengers, or they are not well shaped, so this may help someone who wants to ease himself/herself may be in banana trees or bushes.Yes, few areas this is still seen,*" reported a staff member from Nyabihu.

A staff member from Rwamagana reported *"There is a problem of open defecation. If you walk around, you find flies that on feces in and this confirm open defecation."*Open defecation was also

reported to be more prevalent in rural areas of the Kigali Province districts. Some participants said that they used to have public latrines, which are no longer functional, and this could be a cause of open defecation. "*There are no public toilets on road side, hence, open defecation,*" said a staff member from Kayonza.

A respondent from Nyabihu stated "*If I go back a little bit about open defecation, there were some measures taken in the past which started to bear fruit. They started to build toilets near the public paths. It had reduced the open defecation because when one was not at home and wanted to go to the toilet, he used those ones. Of course, there was a problem of their maintenance, but at least, the toilets were the ones to become dirty but not the roads or other paths.*"

They also stated that those who habituallydefecated in open spaces were those who did not have their own toilets.Fifteen participants suggested publc latrines as the best strategy to reduce open defecation, while 35 recommended sensitization of the community to this unhygienic practice.

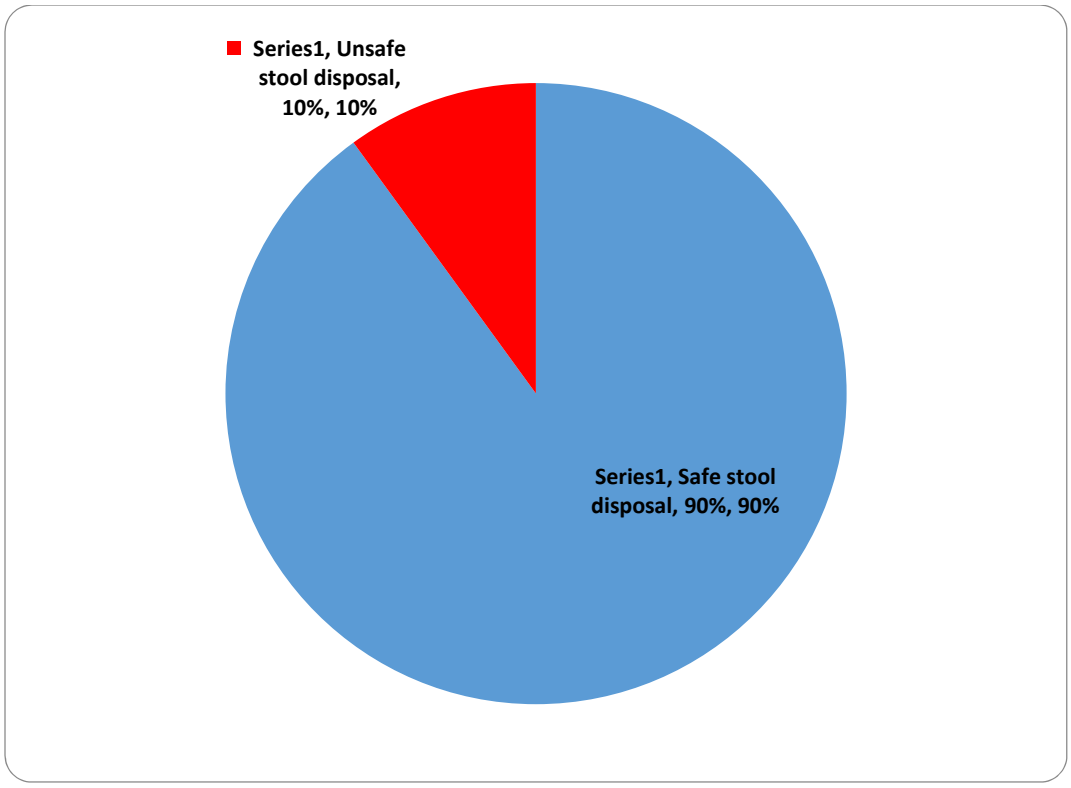


Figure 20: Disposal of children's stools

5.6.3 Sanitation

5.6.3.1. Access to hand-washing stations equipped with soap and water

To convince people to wash their hands after visiting the latrine/toilet, the hand-washing facility must be provided with soap and water. Of 2054 households, 518 (25.2%) had a place for hand washing located within 5 m from the toilet (Table 14). Of these 518 households, 336 (64.9%) had clean water and soap at the observed hand-washing station. Thus, only 16%(336/2054)of households had soap and water at a hand-washing station that was commonly used by the family members (Figure 21).

During the qualitative analysis, a few participants stated that poverty was the key barrier towards the practice of hand washing with soap and water, but that people were aware of its advantages."*There is also poverty where if you wash hands without soap,*" stated a male FGD participant from Nyabihu. A staff member from Kayonza said "Yes*, apart from overall poverty, we believe that a person who has money will buy soap.*"

Of course, some households have hand-washing facilities, commonly known as *Kandagira ukarabe*, with soap, and use them habitually. For instance, a participant from Ngoma said "*When you visit a toilet, you use* kandagira ukarabe *when it is available, and you wash hands with soap. Also, before handling dishes and keep them on a drier, so that the sun rays kill the microbes."*

Participants suggested education of the population about hand-washing practices, given that CHWs and CHC members supported this initiative. "We *should tell them that it is good to wash hands with water and soap whenever they visit the toilet or before eating,*" suggested a female participant from Nyabihu.

Table 15: Location of hand-washing facility

Variable	Nyarugenge n(%)	Kicukiro n(%)	Nyabihu n(%)	Rwamagana n(%)	Kayonza n(%)	Ngoma n(%)	Total N(%)
Place for hand washing within 5 m from the toilet (verified by observation)							
Present	86(22.7)	111(30.7)	70(22.9)	84(24.9)	77(22.9)	90(26.9)	518(25.2)
Absent	293(77.3)	250(69.3)	236(77.1)	253(75.1)	259(77.1)	244(73.1)	1535(74.8)
Total	379(100)	361(100)	306(100)	337(100)	336(100)	334(100)	2053(100)

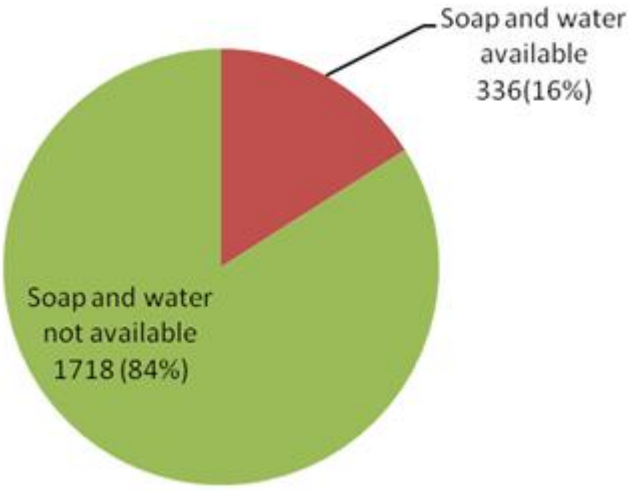


Figure 21: Distribution of households with and without soap and water at hand-washing stations

5.6.3.2. Access to improved sanitation facilities

A safe environment free from fecal pollutants and vectors of disease transmission largely depends on the status of sanitation facilities. In households with improved sanitation facilities, disease vectors have a very small or no role to play. We found that 32% of households used an unimproved sanitary facility (Figure 22). In total, 1585 (63%) households had latrines in the form of slabs, and 630 (25%) households used pit latrines equipped with slabs or tree logs; only 93 (3.7%) households had waterborne toilets, while 71 (2.8%) had no latrine/toilet at all (Figure 23). Pit latrines with slabs (580 households, 37.3%) do not prevent flies and other disease vectors from entering into the latrine (See Appendix 3). Of all the latrines/toilets used, 788 (33.3%) had no doors, and hence, did not provide privacy for the users. Moreover, in 783 (33.1%) latrines/toilets, the floors and walls were smeared with feces, which discouraged frequent and new users from using them.

The qualitative analysis showed that almost all households had toilets, although most of them were not in good condition. *"I may say they have toilets though they are improper. Because they may have just pits with walls around but without all required materials. But it doesn't mean that those toilets without all required materials can't cause us other problems,"* reported a staff member from Ngoma.

The population is really concerned about possessing a clean and improved toilet facility per household. "*About toilets, figures are increasing. Though they might be there, they are not well equipped because some are not roofed. But I attest that figures are mounting. We are now changing our mindset, and people are building well-equipped toilets instead of miserable ones,"* reported one CHW from Nyabihu.

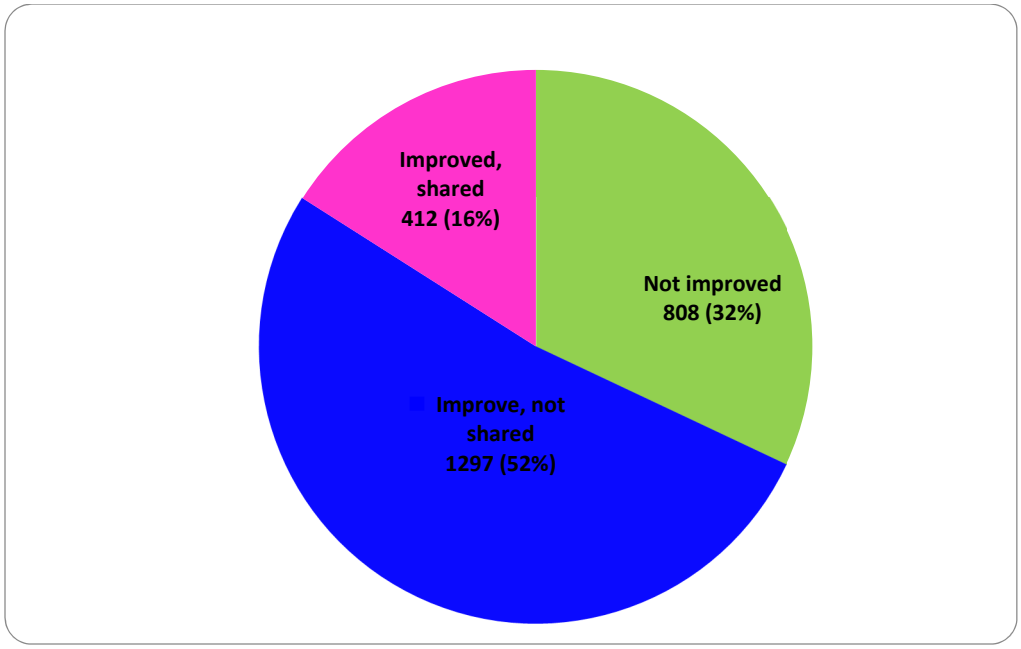


Figure 22: Households with access to improved sanitation facilities

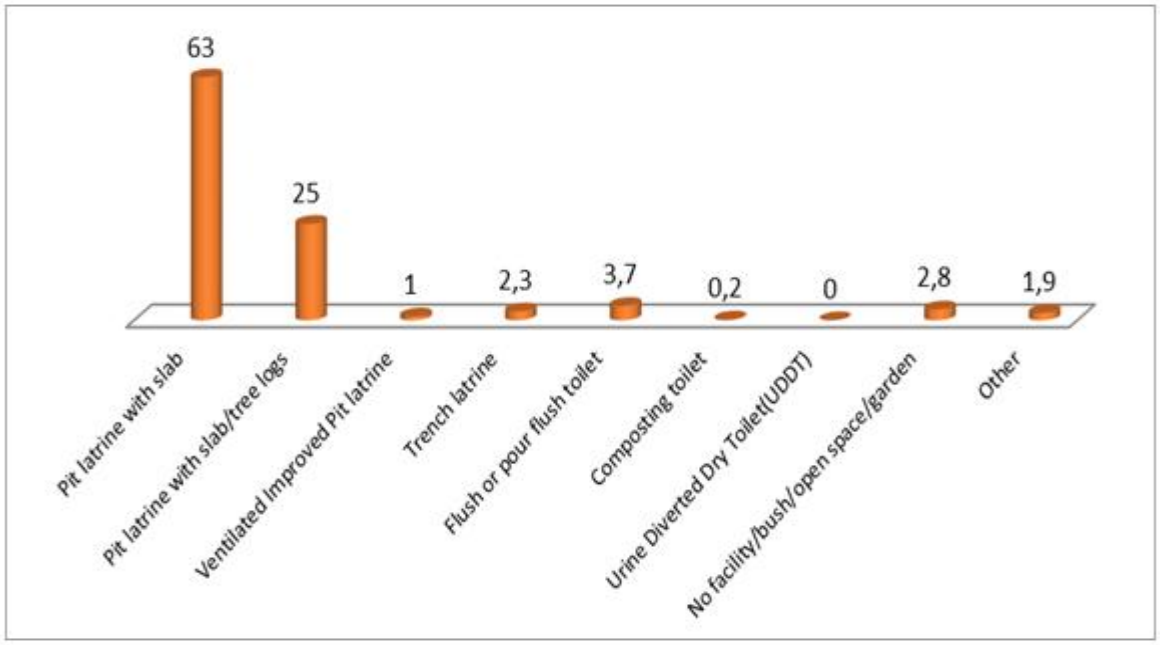


Figure 23: Percentage distribution of households by type of toilet/latrine facility

5.6.4 Access to clean water

Overall, 16%of households used unimproved sources of water, which are considered unhealthy (Figure 24).

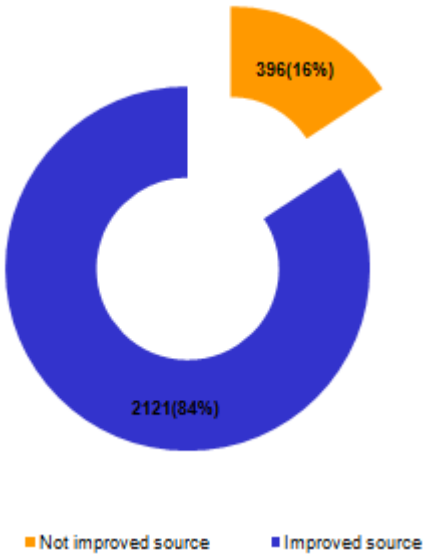


Figure 24: Percentage distribution of households by source of drinking water

5.6.4.1 Proper treatment of drinking water

One of the major vehicles of WASH-related disease transmission is contaminated drinking water. Drinking water can be contaminated at the source, during fetching (by dirty water containers), transportation, and poor handling at home. It is important, therefore, to treat water at the household level. In this study,1401 (56%) households reported treating drinking water properly by using methods such as boiling (1265,90.3%), chemical purification (55, 3.9%), and ceramic and sand filters(48, 3.4%;Figure 25;see also in Appendix 3).

The qualitative assessment showed that some households drink untreated water. They normally treat water fetched from a very bad source. "*The one who boils water, boils only that one from the valleys,*" said a staff member from Ngoma. Most participants did not have this problem since they had access to clean water, which should also be treated prior to drinking. "*But even if we say that that water is clean, some actions are required. After fetching it, we need to boil it, store it in a clean container before drinking it,*" said a male FGD participant from Nyabihu.

Generally, the population knows that treating water prior to drinking is good, but the biggest challenge to this practice is poverty. One male FDG participant from Nyabihu said "*As we have been already discussing, the biggest challenge is poverty where people can be wondering where they will find wood for boiling water.*"Treatment of water prior to drinking was most commonly found in districts with urban areas, such as Kicukiro.

Normally, public health institutions sensitize the general population about drinking water treatment. For instance, a staff member from Ngoma confirmed "*We sensitize people using treated drinking water, and we ask them to keep water in clean, treated container s, and we ask them to use water before 3 days because after 3 days there is bad smell occurring, and potable water does not have a smell. Normally, water cannot be used after 3 days kept in the recipient. There are also other chemicals provided by Society for Family Health such as hydrogen Peroxide and Sur'Eau to help people who do not have enough firewood to boil water or time. We sensitize them about using those chemicals in 20-L jerry cans and wait some minutes to kill some microbes. Also Procter & Gamble (P&G purifier of water) is used, especially when water is not clean, and the process of purification used is decantation. Another way used by WASAC* [Water and Sanitation Corporation]*to treat is using sodium hypochloride. Briefly, the main ways of treating water used are boiling and using chemicals."*

There are very good examples that need to be imitated, and lessons need to be scaled up in other areas. A female FGD participant from Ngoma said "*We boil water from marshland for drinking purpose. After boiling water that green because of flora, we filter it with water filter and remove waste."*

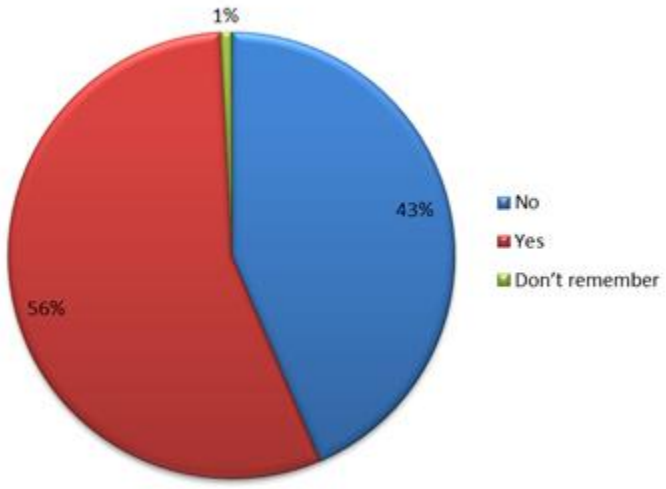


Figure 25: Percentage of households that properly treat drinking water

5.6.4.2 Proper storage of drinking water in households

In most cases, drinking water that is fetched from safe sources and/or very well treated at home using the right methods and in accordance with acceptable standards, may become contaminated and dangerous to consumers because of poor storage in dirty and uncovered containers. In this study, 1494 (59%) households stored their drinking water properly (Figure 26).Of these households, 1440 (96%) stored drinking water in covered containers. The majority of respondents stored drinking water in jerry cans (1400, 93.7%). This container is optimal because it has a narrow opening, and to get water from it, one must use the pouring approach; nevertheless, these containers must also be well maintained, kept clean, and frequently and

thoroughly washed. Only 22 (1.5%) households did not wash their drinking-water containers for more than a month; the majority (1299, 86.9%) cleaned the containers once a week.

Some FGD participants declared that they normally had clean containers reserved for drinking-water storage. *"We prepare drinking water by cooking it and let it boil, pour it into a clean container, and cover it,"* said a CHW from Nyabihu. In some districts, water filters were used for both treating and storing water. *"There was an organization that gave some filters to vulnerable people. We encourage them to pour in water, so that they drink from the filter because that water is clean. Because this water contains sand, any kind of water you can pour in that filter, it comes out clean,"* reported a CHW from Kicukiro.

Participants from areas where it is hard to get clean water requested for this infrastructure to be made available to them owing to concerns for their health. They also advocated for water-treatment products to be made available at an affordable price, so that the population could access them easily. *"If we can get those chemicals for treatment of water, which are expensive, so that we can have them on affordable price. A packet used for 15 liters of water is 50 RwF. This means a 10-liter container/jerry can is 100 RwF. Since we use much water in our households, we wish to have those chemical at a low price, so that people can afford it. It can be helpful if the whole district can be supplied with water,"* requested the same key informant.

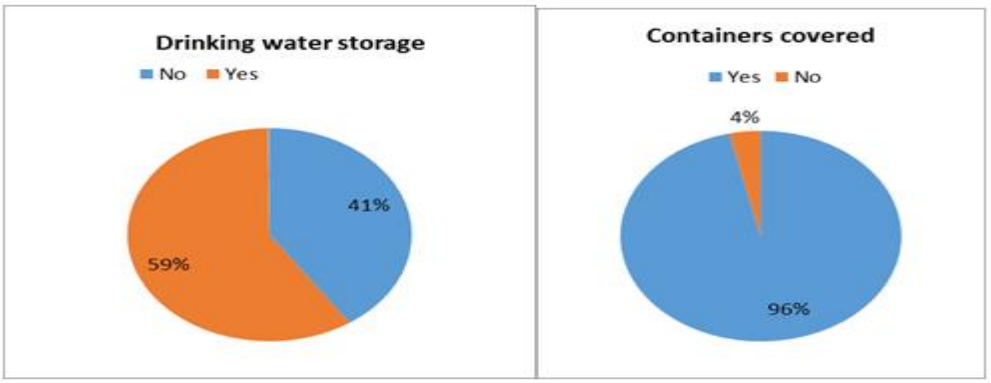


Figure 26: Percentages of households with proper water storage and covered water-storage containers

5.7 Morbidity and Health-Services Utilization

5.7.1 Diarrheal disease

5.7.1.1 Prevalence of Diarrhea

Diarrheal diseases constitute one of the main causes of death among young children in developing countries, as they are associated with dehydration. In the 2 weeks preceding this survey, 360

(22%) children aged under 5 years had diarrhea (Figure 27). This is higher than the national diarrhea prevalence rate of 12% and may be attributable to the seasonal variation in the occurrence of the illness.

Qualitative assessment confirmed the quantitative findings; almost all districts reported that diarrheal diseases were prevalent in their area. For instance, a key informant from Ngoma stated that diarrheal diseases were among the most frequent diseases in the area. "*Based on research, 47% of diarrheal diseases should be prevented when people practice hand washing in the right time.*"

Fifty participants highlighted diarrheal diseases as consequences of poor hand-washing practices, drinking untreated water, and open defecation. A CHW from Kayonza said "*The impact of attending the nature call in ways–defecating in an open space—this contaminates water because when it rains, all those dirty go down in water that some use because of poverty and drink it untreated, and we suffer from diseases caused by microbes.*"

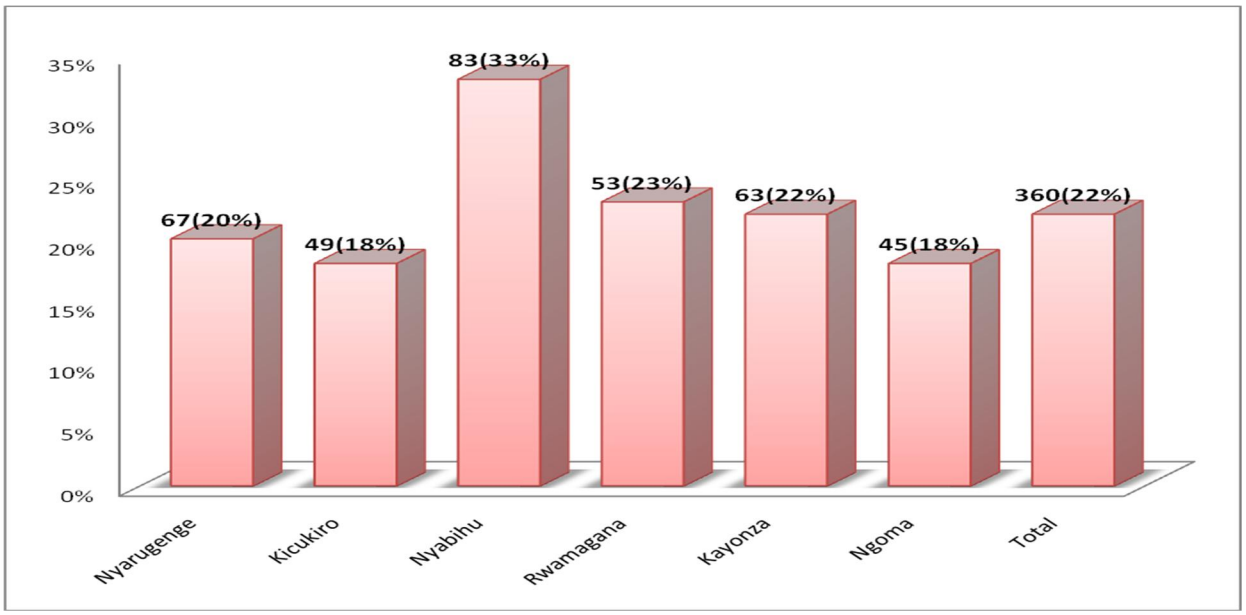


Figure 27: Children aged under 5 years who had diarrhea in the 2 weeks preceding the survey

5.7.1.2 Treatment of diarrhea

To combat the effects of dehydration, WHO recommends the use of oral rehydration therapy with a solution of oral rehydration salts prepared from packets or a solution prepared at home using clean water, sugar, and salt (known as recommended home fluids). In our survey, 50% of children with diarrhea received treatment with oral rehydration solution and 7.5% with a

recommended home fluid. Notably, 40.3% of children with diarrhea received no treatment at all (Table 15).

All FGDs and key informants converged on the key role of CHWs in treating diarrheal diseases in the community, with possible referrals of complicated cases to health centers. A male FGD participant from Kicukiro confirmed "*There is another good service CHWs provide. They have some medications, easy to administer. When they are able, they treat the child; if not, they refer them to the health center (HC). When the child is vomiting or having diarrhea or fever, they treat them. That is a good service of the village level.*"

The good thing is that CHWs are very happy and proud of what they are doing to save the lives of kids, and they feel valued at the community level, but they complained about the insufficiency of drugs. "*In general, health services are being provided, as we were given the right and capacity to treat children under 5 years and adult people. The problem is that we do not have enough medicines, as for example, I brought like five drugs, and when five adult persons came, the drugs are finished and those who came after do not get treatment, but they participate in health services."*

Health-services utilization was reported to be low, as many people did not have community-based health insurance due to poverty. A female FGD participant from Nyabihu said "*Someone may not be able to pay health insurance for all family members. In this case, those who are not insured will not use health services."*This was a general concern and was stated by 58 FGD participants and key informants who thought that as community-based health insurance coverage increases, health-services utilization will increase. "*Community health insurance is the key to health services utilization,"* confirmed a female FGD participant from Nyabihu.

Table 16: Treatments given to children aged under 5 years who had diarrhea in the 2 weeks preceding the survey

Variable	**Nyarugenge**	**Kicukiro**	**Nyabihu**	**Rwamagana**	**Kayonza**	**Ngoma**	**Total**
	n(%)	**n(%)**	**n(%)**	**n(%)**	**n(%)**	**n(%)**	**N(%)**
What was given to the child during the time s/he had diarrhea?							
A fluid made from a special packet called ORS	31(46.3)	30(61.2)	35(42.2)	27(50.9)	30(47.6)	27(60)	180(50)
A government-recommended home fluid	1 (1.5)	4(8.2)	11(13.3)	3(5.7)	5(7.9)	3(6.7)	27(7.5)
Both	0(0)	2(4.1)	1(1.2)	1(1.9)	2(3.2)	0(0)	6(1.7)
Nothing	35(52.2)	13(26.5)	35(42.2)	21(39.6)	26(41.3)	15(33.3)	145(40.3)
Refused to answer	0(0)	0(0)	1(1.2)	1(1.9)	0(0)	0(0)	2(0.6)
Total	67(100)	49(100)	83(100)	53(100)	63(100)	45(100)	360 (100)

5.7.2 Nutrition education and counseling

In our survey, 43.5% of respondents reported that they had received nutrition education and attended a counseling program in the village, and 27.4% had attended a session in the month prior to the survey (Table 16). Nyabihu had the highest percentage (42.6%) of respondents who participated in this program. One in three respondents reported having received nutrition support, and most had received counseling on exclusive breastfeeding (48.7%) and adequate complementary feeding starting from 6 months (12.7%;see Appendix 4).

During the qualitative assessment, some initiatives being implemented at the community level were highlighted such as the *Girinka* program, kitchen gardens, child's cup of milk, and village kitchens. Additionally, some families were given small livestock animals (such as swine) although these were yet to be provided to some households in need. A local implementing partner from Kicukiro said "*We have other strategies to increase family capacities and well-being through helping families to get vegetables and kitchen garden. Even possibly, some families will receive domestic cattle.*"

The Vision 2020 Umurenge Program (VUP) helped many households to effectively address malnutrition. "*I wanted to say the same thing that the government programs like VUP should have a policy of creating projects that can support the population,*" said a male FGD participant from Kicukiro.

Some key informants stated that since many partners are willing to join in the efforts to implement the District Plan to Eliminate Malnutrition, there is a hope that malnutrition will not "escape their eyes." A key informant from Ngoma said *"Eliminating malnutrition is not a task for one institution. As we said before, there is DPEM* [District Plan to Eliminate Malnutrition], *which coordinates all activities related to eliminating malnutrition, and development partners like SNV and CRS have wished to work with this umbrella. And the time they will start implementing their activities and supporting DPEM, malnutrition will be tackled. Other stakeholders involved are MOH (*Ministry of Health)*, district technicians, local government, and other institutions like security organs to prevent conflicts within families. I think malnutrition will be tackled once DPEM will start working effectively in partnership with all those stakeholders."*

Table 17: Percentage of caregivers who were aware of and participated in nutrition education and counseling

	Nyarugenge	Kicukiro	Nyabihu	Rwamagana	Kayonza	Ngoma	Total
Variables	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	N(%)
Is there any nutrition education and counseling program in the village?							
No	260(62.5)	226(55.8)	149(35.3)	198(47.7)	228(53.4)	212(51.3)	1,273(50.9)
Yes	129(31.0)	155(38.3)	255(60.4)	183(44.1)	183(42.8)	182(44.1)	1,087(43.5)
Don't know	27(6.5)	24(5.9)	18(4.3)	34(8.2)	16(3.7)	19(4.6)	138(5.5)
Total	416(100)	405(100)	422(100)	415(100)	427(100)	413(100)	2,498(100)
In the last month did attend any session on nutrition education and counseling?							
No	331(80.3)	314(78.7)	240(57.4)	304(74.7)	302(71.4)	302(73.6)	1,793(72.6)
Yes	81(19.6)	85(21.3)	178(42.6)	103(25.3)	121(28.6)	108(26.3)	676(27.4)
Total	412(100)	399(100)	418(100)	407(100)	423(100)	410(100)	2,469(100)

5.7.3 Distribution of vitamin A, micronutrient powder, and deworming tablets

Children are administered vitamin A to reduce visual impairment and childhood infections; deworming tablets to prevent intestinal parasitical infection, and micronutrients to improve their nutrition status. Caregivers of children aged less than 5 years were asked if the child had received vitamin A, deworming tablets, and micronutrient powder in the 6 months preceding the survey. Most children had received vitamin A (86%) and deworming tablets (81%), but few had received micronutrients (6%). Nyabihu had the highest distribution of micronutrient powder (31%; Figure 28).

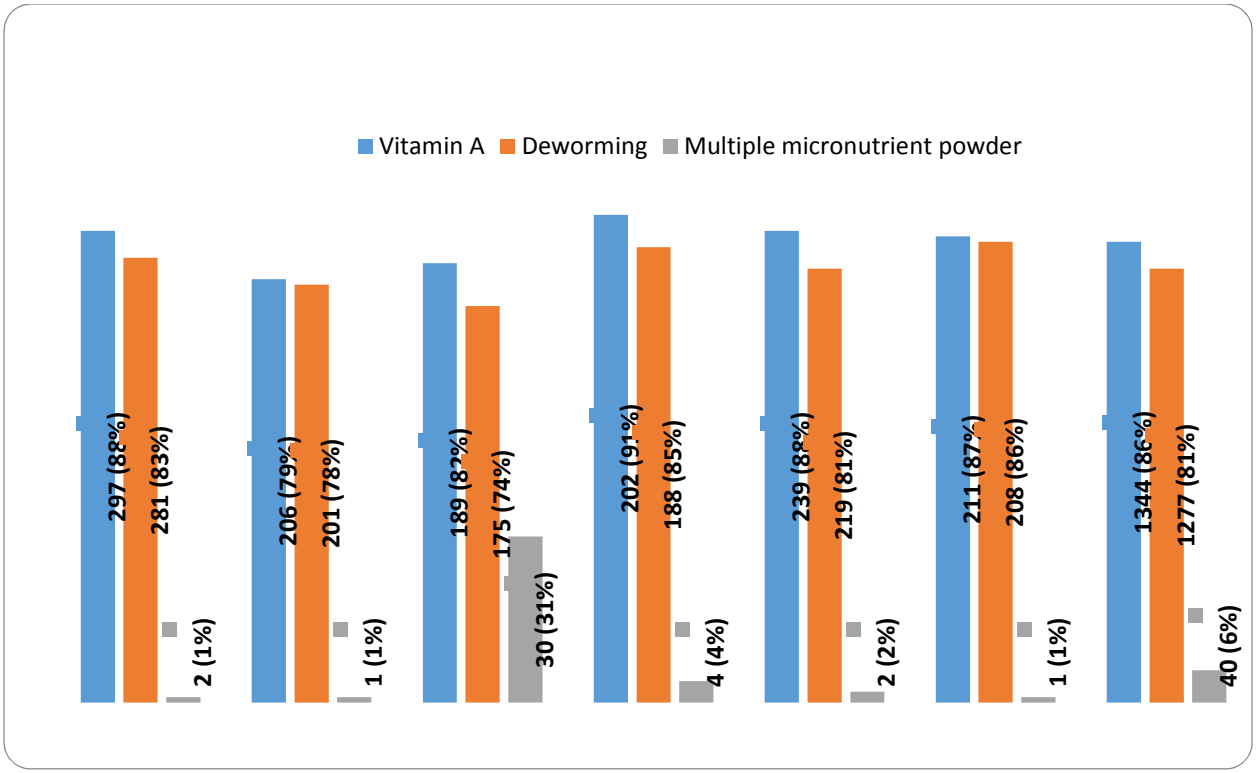


Figure 28: Children aged under 5 years who received in the last 6 months vitamin A, deworming tablets, and micronutrient powder in the week preceding the survey

5.7.4 Vaccination of children

Immunizing children against vaccine-preventable diseases can greatly reduce childhood morbidity and mortality. Figure 29 presents the vaccination coverage based on both vaccination-card information and for children without a card, information provided by the mother. A total of 127 (8%) children aged under 5 years had never received any vaccination. According to WHO, countries aiming at measles elimination should achieve ≥95% vaccination coverage in every district.

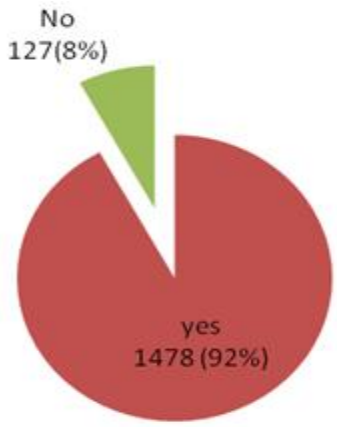


Figure 29: Children aged under 5 years who had received any vaccination

5.7.5 ANC practices

Monitoring pregnant women through ANC visits helps to improve pregnancy outcomes by reducing risks and complications during pregnancy, delivery, and the postpartum period. According to our survey, 44% of mothers had attended four or more ANC consultations during their last pregnancy. This proportion is consistent with the national level of 44% reported in RDHS 2014–2015[8]. Rwamagana and Kayonza had the highest and lowest proportions of women who had attended at least four ANC consultations, at 54.1% and 38.4%, respectively (Table 17).

The qualitative assessment revealed many factors hindering the uptake of ANC, such as a misconception which revealing that one is pregnant during the early pregnancy may lead to its "poisoning" and that health-service providers require a pregnant woman to be accompanied by her husband/partner for the first ANC visit. One health-service provider from Kicukiro said "*We are trying to fight that but as you know, behavior change is a process, and it takes time. They think that if they come for ANC before the pregnancy is visible, they may poison her pregnancy; that is why they attend ANC visits when the pregnancy has already grown enough. That is also a barrier. Another barrier is linked to late attendance for the first ANC in the first trimester of pregnancy whose husband goes on mission to come back may be at 5 months of pregnancy. The woman takes the decision to wait for him, and this is also a challenge, but for the first challenge, we have to strengthen behavior-change communication; it takes time.*"

The routine provision of ANC services is also a barrier to some pregnant women who must pay for laboratory exams every time they visit the health facility, as these tests are expensive, especially, for those without health insurance. A CHW from Nyarugenge said "O*ther thing, I say that because it happened in our village. When you see a woman for pregnancy check-up, and they are required some exams that are not covered by the health insurance. They prefer to go in private clinics where they can get those services at about eight thousands and when coming back again for the second*

ANC check-ups, they are denied services. I called them myself, and they told that it is not possible, as they did not bring the previous exam. So they go back to Kacyiru for other check-up exams. The barrier they meet is about the exams required three or four exams, which are expensive to extent that they can afford them and the time of the rendez-vous is not respected. I say this because I know that, but there is when my colleague immediately denies, but in our village it happened. That is what I see as a barrier, as they can't be checked up secondly without bringing that exam."

Other barriers stated by FGDs and key informants include the distance to the health facility (mentioned by 36 respondents), home conflicts (3 respondents), ignorance (50 respondents), illegitimate pregnancy (33 respondents), and mindset (82 respondents). WHO recommends that women obtain early ANC to improve their chances of a healthy pregnancy. However, in our survey, only 80 (34.3%) women made their first ANC visit before the fourth month of pregnancy.

One of the strategies being implemented by the Ministry of Health to ensure and facilitate access to and the use of ANC is advising men to be actively involved during their wives pregnancy and delivery. In our survey, the majority of women (761, 78.7%) attended at least three ANC visits with their husbands.

The qualitative assessment revealed that having husbands accompany their wives to ANC visits is still a challenge in some areas. A health-service provider from Kicukiro said "*Women who have husbands who do not care about accompanying their women to antenatal services.*" Another service provider from Nyarugenge said *"The second barrier during the first trimester is that sometimes the husband is not ready to go with you. In case he is, for example, a policeman or a soldier and in on mission."*

Many husbands did not support their wives during pregnancy, as they viewed their wives as being dependent on them. Some husbands delayed their wives first ANC visit until the pregnancy was advanced, rather than going during the first trimester, as recommended. A health service provider from Kayonza said "*While it is recommended to go for the first ANC visit with a husband, some males refuse to accompany their wives and therefore delay the first visit."*

Table 18: Number of antenatal care visits and timing of first visit

variable	Nyarugenge	Kicukiro	Nyabihu	Rwamagana	Kayonza	Ngoma	Total

	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
Number of ANC for last pregnancy							
<4 visit	79(59.4)	73(54.5)	142(54.4)	51(45.9)	77(61.6)	66(60.6)	488(55.9)
4+	54(40.6)	61(45.5)	119(45.6)	60(54.1)	48(38.4)	43(39.6)	385(44.1)
Number of months pregnant at time of first ANC visit							
Late (Above 4 months pregnant)	40(71.4)	9(25.7)	22(84.6)	21(87.5)	43(75.4)	18(51.4)	153(65.6)
Timely (below 4 months pregnant)	16(28.6)	26(74.3)	4(15.4)	3(12.5)	14(24.6)	17(48.6)	80(34.3)
women who attend at least 3 pre-natal visits with their husbands							
Yes	105(83.3)	91(79.1)	179(69.4)	77(78.6)	95(84.8)	84(90.3)	631(78.7)
No	21(16.7)	24(20.9)	79(30.6)	21(21.4)	17(15.2)	9(9.7)	171(21.3)

5.8 Factors Associated with Diarrheal Diseases

5.8.1 Relationship between water and diarrheal diseases

Factors associated with diarrheal diseases were assessed to inform the project about where to focus efforts to reduce infectious diseases like diarrhea. The incidence of diarrhea was not associated with the source of water ($p>0.05$), but was associated with water treatment; those who treated their drinking water before use were protected against diarrheal diseases (OR=0.79, p=0.046; Table 18).

Table 19: Relationship between water and diarrheal diseases

Diarrhea	Odds ratio	95% Confidence interval	p value
Source of drinking water			
Unimproved source	1.00		
Improved source	1.00	0.73–1.38	0.982
Water treatment			
Drinking water not treated	1.00		
Drinking water treated	0.79	0.62–1.00	0.046

5.8.2 Relationship between sanitation and diarrheal diseases

Toilet quality was not found to be associated with diarrheal diseases. However, child stool disposal was related with diarrheal diseases: households with unsafe methods of child stool

disposal were more likely to have diarrheal diseases among children (OR=1.48, p=0.045; Table 19).

Table 20: Relationship between sanitation and diarrheal diseases

Diarrhea	Odds ratio	95% Confidence interval	p value
Toilet quality			
Improved, not shared	1.00		
Improved, shared	1.22	0.89–1.66	0.211
Not improved	1.23	0.94–1.60	0.138
Child stool disposal			
Safe disposal	1.00		
Unsafe disposal	1.48	1.01–2.16	0.045

5.8.3 Relationship between hand washing and diarrheal diseases

A strong relationship was found between diarrheal diseases and hand washing. Respondents who did not wash their hand safely using the toilet were almost twice as likely to have diarrheal diseases as those who did (OR=1.63, p=0.001; Table 20).

Table 21: Relationship between handwashing and diarrheal diseases

Diarrhea	Odds ratio	95% Confidence interval	p value
Hand-washingstatus			
Hand washing	1.00		
No hand washing	1.63	1.22–2.19	0.001

5.8.4 Relationship between Ubudehe categories and diarrheal diseases

No relationship was found between diarrheal diseases and any Ubudehe category (p>0.05 for all categories). Although not significant, households belonging to Ubudehe categories 3 and 4 were more protected against diarrheal diseases than those belonging to Ubudehe category 1 (OR=69, p = 0.070 for category3; OR=0.97, p =0.982 for category 4; Table 21).

Table 22: Relationship between Ubudehe categories and diarrheal diseases

Diarrhea	Odds ratio	95% Confidence interval	p value
Ubudehe category			
Ubudehe 1	1.00		
Ubudehe 2	1.02	0.68–1.52	0.935

Ubudehe 3	0.69	0.46–1.03	0.070
Ubudehe 4	0.97	0.10–9.64	0.982

5.8.5 Relationship between district of residence and diarrheal diseases

The incidence of diarrhea diseases in Nyabihu was twice that in Nyarugenge. The incidence in Kicukiro was lower than that in Nyarugenge, though the difference was not statistically significant (OR=0.93, p=0.716; Table 22).

Table 23: Relationship between district of residence and diarrheal diseases

Diarrhea	Odds ratio	95% Confidence interval	p value
District of residence			
Nyarugenge	1.00		
Kicukiro	0.93	0.62–1.40	0.716
Nyabihu	2.05	1.41–2.99	0.000
Rwamagana	1.24	0.83–1.87	0.295
Kayonza	1.21	0.82–1.79	0.327
Ngoma	0.92	0.60–1.40	0.693

5.9 Factors Associated with Child MDD

5.9.1 Socio-demographic characteristics

The MDD for children is defined as the consumption of four or more food groups in a period of 24 hours. District of residence was significantly associated with the number of children achieving MDD, which was three times greater in Kicukiro (OR = 3.35, p = 0.002) and two times greater in Nyarugenge (OR=2.2, p=0.024; Table 23) than in Nyabihu. Although not statistically significant, the number of children achieving MDD was lower in Kayonza than in Nyabihu.

Table 24: Minimum dietary diversity among children and socio-demographic characteristics

Minimum dietary diversity	Odds ratio	95% Confidence interval	p value
Child sex			
Male	1.00		
Female	1.12	0.74–1.70	0.583
Household size			
6 or more members	1.00		

4 or 5 members	1.12	0.72–1.77	0.611
1–3 members	1.50	0.80–2.82	0.207
District			
Nyabihu	1.00		
Nyarugenge	2.22	1.11–4.45	**0.024**
Kicukiro	3.35	1.58–7.11	**0.002**
Rwamagana	1.54	0.70–3.35	0.280
Kayonza	0.56	0.23–1.38	0.209
Ngoma	1.38	0.62–3.10	0.432

5.9.2 Socioeconomic characteristics

The source of household income, source of food, and WDDS were associated with the achievement of MDD in children (Table 24). Children whose parents' incomes were derived from full-time employment were more likely to eat diverse food groups than those whose families earned their income from selling agricultural or livestock products (OR=2.5, p=0.013). In contrast, the children of daily laborers were less likely to eat diverse food groups than those whose parents' incomes were derived from selling agricultural or livestock products. Children from families who bought food from the market were almost twice more likely to eat diverse food groups than those families acquired food by harvesting it (OR=1.78, p=0.043). Children of those who received food as in-kind payment were less likely to consume diverse food groups than children of those who harvested their own food. Compared to mothers with low dietary diversity, mothers with good dietary diversity had children with good dietary diversity (p<0.001). Surprisingly, we did not find a significant association between possessing a kitchen garden and child MDD.

Table 25: Socioeconomic characteristics and minimum dietary diversity among children

Minimum dietary diversity	Odds ratio	95% Confidence interval	p value
Source of income			
Sale of agricultural or livestock products			
Full-time employment	2.53	1.22–5.26	**0.013**
Trading	1.60	0.81–3.19	0.178
Day labor	0.48	0.28–0.83	**0.009**
Remittance, loans, or other	1.11	0.57–2.16	0.762
Main source of food			
Harvesting	1.00		
Buying food from the market	1.78	1.02–3.10	**0.043**
Both (harvesting and buying)	1.04	0.52–2.06	0.918
In kind payment	0.38	0.16–0.90	**0.028**
Women's dietary diversity score (WDDS)			
Low WDDS	1.00		

Medium WDDS	4.02	2.30–7.03	**0.000**
High WDD	10.53	5.29–20.97	**0.000**
Own agricultural land			
Yes	1.00		
No	1.23	0.81–1.87	0.342
Own livestock			
Yes	1.00		
No	1.13	0.74–1.73	0.570
Kitchen garden observed			
Yes	1.00		
No	1.01	0.63–1.62	0.978

5.9.3 Nutrition knowledge and child MDD

Media are key channels for nutrition education. Listening to the radio and having information on breastfeeding and complementary feeding were found to be associated with the provision of the MDD to children ($p<0.001$). Children in families who ever received nutrition support were almost twice as likely to eat diverse food groups as those in families who did not receive this support (Table 25).

Table 26: Nutrition knowledge and minimum dietary diversity among children

Minimum dietary diversity	Odds ratio	95% Confidence interval	p value
Listens to the radio			
No	1.00		
Yes	3.13	2.03–4.80	**0.000**
Heard or seen messages about breastfeeding			
No	1.00		
Yes	2.19	1.43–3.38	**0.000**
Received information about complementary feeding			
No	1.00		
Yes	1.69	1.08–2.65	**0.022**
Knows appropriate age for starting complementary foods			
No	1.00		
Yes	3.88	0.49–31.03	0.201
Ever received nutrition support			
No	1.00		
Yes	1.64	1.08–2.49	**0.021**

6 DISCUSSION

The prevalence of chronic malnutrition or stunting among children aged under 5 years remains persistently high in Rwanda. Stunting, which results in delayed growth, affects 38% of children under the age of 5 years. Indirectly, the high prevalence of malnutrition contributes to the current infant-mortality rate in Rwanda, which is estimated at 50 per 1000 live births (2). Good nutrition, clean water, and a hygienic environment are crucial for any community health program to prevent malnutrition; however, these necessities are out of the reach of many low-resource countries, including Rwanda. It is in this context and in partnership with the Rwandan Government that a consortium of two international agencies—CRS and SNV—is about to implement the *Gikuriro* program in six districts in Rwanda. In the baseline *Gikuriro* survey, we aimed at establishing indicators of socioeconomic and demographic characteristics, child nutrition, household food security, WASH activities, morbidity, and health-services utilization.

6.1 Socioeconomic and Demographic Characteristics

The low socioeconomic status of a household was characterized by a large household size (six or more members), which was negatively associated with food security. In the *Gikuriro* intervention area, family or household size was large, with almost half of the interviewed households (48.3%) having six or more members. This finding is consistent with that reported by RDHS 2014–2015 (2), in which many women said that they would ideally want to have fewer children than they already had. These households are likely to be vulnerable as shown by Ali Naser et al. (19), who found that the proportion of households with many members was higher among food-insecure households than among food-secure households.

In this baseline survey, we found that one in three households (28.3%) was headed by a woman, compared to the national level of 31% (2). Household food security was related to the gender of the head of the household. For example, CFSVA 2015 showed that among households headed by women, 31% were either food insecure or marginally food secure, compared with 21% of households headed by men. One explanation for this is that in 70% of cases, female heads of households were widows and had fewer adult household members who could contribute to the household income.

Almost half of the households in the *Gikuriro* intervention area were in Ubudehe categories 1 or 2 (49.6%), with even higher percentages in Nyabihu (63%) and Ngoma (64%). Under the Ubudehe program(20), households are categorized according to their poverty status. The classification of households takes several aspects of poverty into account, but is most strongly linked to resources and assets available in the household, such as land and livestock, and the ability of the household members to sustain their livelihoods. The households targeted for assistance are mostly the poorest households in Ubudehe categories 1 and 2, which have high levels of food insecurity.

In 1998/99, when Vision 2020(21) was developed, the national consultative process stated that "Telecommunication coverage in Rwanda is very low." The information and communication technologies sector has been regarded as a key element in Rwanda's development. It is formulated in the Rwandan communication policy that by 2020, telephone services will be widespread in rural areas to attract investors. In line with the mentioned policies, we gathered information on the possession of selected information and communication technology devices, which also indicate the household's socioeconomic status. We found that three in five (66%) households owned a mobile phone. The second most common household asset was a radio, which was owned by 48% of households.

The main source of household income in the *Gikuriro* intervention area was selling agricultural produce (35.1%) and working as a day laborer (32.7%). Many households in the two Kigali Province districts derived their income by working as day laborers, while households in the remaining districts mostly depended on the sale of agricultural produce. These findings are like those reported by the 2010/11 Integrated Household Living Conditions Survey, which showed that at the national level, the selling of agricultural produce contributes the largest share of a household's income. Unfortunately, food-insecure households are typically rural households that mainly depend on the sale of agricultural produce or on daily labor.

6.2 Household Food-Security Status and CSI

Many households (69.2%) reported experiencing stress due to lack of food or money to buy food in the 30 days preceding the survey. Thus, most households sampled had food-access issues. In line with other measures of food security, the largest proportion of households experiencing stress due to lack of food or money to buy food was found in Nyabihu District, Western Province (85.5%, 361/422). A high proportion of the study population (37.5% of households) reported that food bought from the market was their main food source. The most commonly used coping strategy was "buying less-preferred and less-expensive food" (83.9%), followed by "reducing the number of meals eaten in a day," which 69.1%of households did two or more times a week. Households with low CSI scores were less food insecure (i.e., more food secure) than households with high CSI scores. CSI scores varied between the two Kigali Province districts and the other districts: Kicukiro had the lowest average CSI score (19.9; SD=14.6),while Nyabihu had the highest average CSI score (33.1;SD=26.2).

We analyzed the above results to understand which households faced food insecurity and why. We found that food-insecure households were typically rural households that were dependent on the sale of agricultural produce or on daily labor. Compared to food-secure households, food-insecure households had less livestock, less agricultural land, grew fewer crops, were less likely to have a vegetable garden, had lower food stocks, and consumed more of their own production

at home. Nyabihu had the largest proportion of households with high CSI scores (47%). This means that they tended to rely on several different coping strategies several times a week. An FGD participant from Nyabihu said*"In this area, people who get appropriate food are few, including those who own lands. Everyone depends on markets. For example, I don't own a land where I can get like a kilogram of beans. Everything that I get is from markets, or if I work for food from a neighbor."*"*What I can say is that during rainy season at least one can have appropriate nutrition. During this time because dryness, we all depend on markets, and our nutrition is negatively affected,"* said a female FGD participant from Nyabihu.

6.3 Women Dietary Diversity Score (WDDS)

The food groups most commonly consumed by women in the *Gikuriro* districts were starchy staple foods (55.2%) and legumes, nuts, and seeds (51.7%), while the least-consumed food groups were eggs (4.2%) and flesh foods (5.1%–12.2%). Additionally, 46%of women had low dietary diversity (≤3 food groups), 37% had medium dietary diversity (4 or 5 food groups), and 17% had high dietary diversity (≥6 food groups). The individual dietary diversity scores reflect the nutritional quality of the diet, with higher scores indicating better nutritional quality. The overall average WDDS was 3.8, but with differences across the districts. The highest WDDSs were seen in the two Kigali Province districts, Kicukiro (4.9) and Nyarugenge (4.3), while the lowest WDDSs were seen in the Eastern Province districts, Kayonza (3.2) and Ngoma (3.3).

The above results are consistent with the findings of CFSVA 2015. We qualitatively assessed this food-access issue. Some respondents told us that they had passed nights on an empty stomach due to the lack of something to eat. A male FGD participant from Nyarugenge said "*If they don't have food maybe they sleep without eating, or they eat only once a day. What do you expect from that help?*" Due to climate variability, there are not enough crops, and some families do not eat as frequently as they did before, especially, in agriculturally dependent districts. A female FGD participant from Nyabihu said "*Currently, we do not get that appropriate meals because we did not produce much of crops."*

6.4 Food Consumption Score (FSC)

The Food Consumption Score combines dietary diversity, frequency of consumption (number of days on which each food group is consumed), and the relative nutritional importance of different food groups. Scores are divided into three groups: 0–21, poor food consumption; 21.5–35, borderline food consumption; and >35, acceptable food consumption. In our survey, 60%of households had poor food consumption (severely food insecure), 18%had borderline food consumption (moderately food insecure), and 22%had acceptable food consumption (food secure). The highest proportion of households with poor food consumption was seen in Nyabihu

(69%). The FCSs were consistent with the other survey findings and national reports (13), and prove that food security is a key issue in Rwanda.

6.5 Knowledge on Infant and Young Child Feeding

Biological mothers or other caregivers were asked if they had seen, heard, or read anything about breastfeeding in the mass media or elsewhere in the past 6 months. Nearly half the biological mothers or other caregivers (46.8%) were aware about exclusively breastfeeding infants (0–6 months).However, 12% of biological mothers or other caregivers did not know the recommended length of exclusive breastfeeding, and 45.2% of biological mothers or other caregivers were aware of complementary feeding. The main channel for getting information on feeding infants and young children was the radio. Our survey revealed a gap in the knowledge on feeding infants and young children. Nutrition promotion and education should be focused on improving knowledge of biological mothers or other caregivers about good sources of food for dietary diversity (e.g., ways to enrich porridge).

Media are key channels for nutrition education. Listening to the radio and having information on breastfeeding and complementary feeding were found to be associated with providing the MDD to children ($p<0.001$). Children in families who had received nutrition support were almost twice as likely to eat diverse food groups as those in families who did not receive this support.

6.6 Infant and Young Child Feeding Practices

We found that most children(90%) born in the 2 years preceding the survey had been put on the breast immediately or within 1 hour of birth. However, other good feeding practices were not widely practiced. Almost one in five (14.4%) children aged under 6 months was not exclusively breastfed. Only one in three (29%) children aged 6–23 months consumed the MDD (four or more food groups).Only 9% of children aged 9–23 months received the minimum meal frequency(three or more meals a day),and consumption of protein-rich food was very low (10.2%–25.3%).

Blacket al. found that a low intake of animal-source foods can be a risk factor for stunting, which is probably due to the fact that these foods are good sources of protein and micronutrients(22). WHO recommends that breastfed children consume solid, semi-solid, or soft foods at least twice a day at the ages of 6–8 months and at least 3 times a day at the ages of 9–23 months(23). Compared with the national average (RDHS2014–2015; CFSVA 2015), the infant and young child feeding practices in the surveyed community were relatively poor.

6.7 WASH Activities

6.7.1 Community Health Clubs (CHCs)

In the context of health promotion and as stated in the current Rwanda Health System Strategic Plan, CHC establishment has been proposed to facilitate countrywide community behavior-change communication for better health practices targeting the reduction of infectious diseases. According to our survey, only 831 (33%) respondents were aware of the existence of CHCs, and only 116 (14%) had attended a dialogue session in a CHC.

6.7.2 Personal hygiene

This survey showed that 18% of respondents did not wash their hands with soap and water in the 24 hours preceding the survey. Hand washing before preparing food (1.8%) and after handling children's feces or cleaning children's bottoms (0.8%) was very uncommon. Furthermore, only 127 (6.2%) respondents washed their hands before eating, and 21(1%) respondents washed their hands before feeding or breastfeeding their children.

6.7.3 Sanitation

Of 2054 households, only 518 (25.2%) hada place for hand washing within 5 m from the toilet,and only 336 (16%) had soap and water at a hand-washing station commonly used by family members. In addition, 333 (13.2%) children aged under 3 years defecated anywhere on the ground;however, the stools of 90%of children aged under 3 years were safely disposed (which means that the children used the toilet/latrine, or that their feces were put/rinsed in a toilet/latrine or buried). Fifty-two percent of households had an improved unshared sanitation facility.

6.7.4 Water treatment and storage

We found that 1401 (56%) households treated drinking water properly, and 1494 (59%) households stored drinking water properly. Studies show that access to clean and safe WASH (particularly washing with soap and water before eating, while preparing food, and after defecation) protect against stunting and diseases such as diarrhea(24).To achieve the greatest health benefits, improvements in hygiene should be made concurrently with improvements in water supply and sanitation and be integrated with other interventions, such as improving nutrition and increasing incomes. As formulated in the Third Health Sector Strategic Plan 2014–2018, the Government of Rwanda recognizes the highlighted environmental health issues and key strategies such as implementation of the Libreville Declaration,which has recently started(25).

6.8 Morbidity and Health-Services Utilization

We found that 360 (22%) children aged under 5 years had had diarrhea in the 2 weeks preceding the survey;50% of children with diarrhea had been given oral rehydration solution, and 7.5% had been given a government-recommended home fluid. The prevalence of diarrhea in our survey was nearly twice that reported by RDHS 2014–2015 (12%). This difference may be linked to worse environmental health indicators in the *Gikuriro* intervention area, including the high percentage of households with unimproved sanitation facilities (32%vs. 29% in RDHS 2014–2015). Analytical studies are suggested to better understand the reasons behind the increase in diarrhea prevalence.

With regard to health services, we found that 43.5% of the respondents reported having received nutrition education and having attended a counseling program in the village, and 27.4% had attended a counseling program session in the month prior to the survey. In total, 1344(86%) children aged under 5 years had received vitamin A, and 1277(81%) had received deworming tablets in the 6 months preceding the survey. A total of 127 (8%) children under the age of 5 years had never received any vaccination. While 44.1% of mothers had attended four or more ANC consultations during their last pregnancy, few (80 women, 34.3%) had made their first ANC visit before the fourth month of pregnancy. The majority of women (761, 78.7%) attended at least three prenatal visits with their husbands.

The above results indicate that much effort is needed to reinforce interventions like nutrition education and counseling through community-based nutrition programs. WHO recommends that women obtain early ANC, specifically, in the first semester quarter, to improve the chances of a healthy pregnancy.

7 CONCLUSION

Rwanda is one of the countries to have achieved most of the Millennium Development Goals, and has done particularly well in reducing the number of people living in poverty as well as in improving indicators related to education and health. In spite of these positive developments, food insecurity and childhood stunting continue to pose challenges to many households.

This *Gikuriro* baseline survey showed that the deficiencies in food production and access pose public health problems. The majority of households (69.2%)reported experiencing stress due to lack of food or money to buy food in the 30 days preceding the survey. Similar to the findings of previous assessments, Nyabihu District located in Western Province showed the highest rates of food insecurity and the poorest environmental health outcomes.

Nearly half of all women surveyed consumed a diet with poor nutritional quality. We found that of nine different food groups, women in the *Gikuriro* districts most commonly consumed starchy staple foods (55.2%) and legumes, nuts, and seeds (51.7%),and least commonly consumed eggs (4.2%) and flesh foods (5.1%–12.2%). Dietary diversity was low in 46% of women (≤3 food groups), medium in 37% (4 or 5 food groups), and high in 17% of women (≥6 food groups). Most households bought most of the food they consumed from the market, and only 781(31%) households owned a kitchen garden, even though the Ministry of Health, since 2012, has a policy that that every household in the country should have a kitchen garden.

Similarly, biological mothers or other caregivers' knowledge on infant and young child feeding was still poor. Infant and young child feeding practices were also poor in the surveyed community. Only 6.1% of children aged9–23 months met the requirements for a minimum acceptable diet based on dietary diversity and meal frequency. Consumption of protein-rich food was very low (10.2%– 25.3%). Almost one in five (14.4%) children aged under 6 months was not exclusively breastfed. Efforts must be made to educate, motivate, and support biological mothers or other caregivers to adopt optimal complementary feeding practices.

Indicators of household knowledge, attitudes, and practices related to key WASH activities were still poor. We found that poor personal hygiene was prevalent. Access to improved sanitation facilities was an issue. Diarrhea prevalence was considerable across districts. Much attention is needed regarding the timing of ANC services. While 44.1% of mothers had attended four or more ANC consultations during their last past pregnancy, few (80 women, 34.3%) had made their first ANC visit before the fourth month of pregnancy.

8 RECOMMENDATIONS

This section provides recommendations based on the key findings of the baseline survey. We recommend that more efforts be made to increase the consumption of a balanced diet by improving household food security, increasing household income, and providing education about nutrition and the feeding of young children. We recommend the reinforcement of and capacity building for CHCs, which should actively implement and follow-up WASH practices. In brief, we suggest that the *Gikuriro* project aim to improve household living conditions, agricultural production at the household level, community coping strategies, WASH practices, and the nutritional content of foods consumed by increasing household income and food-purchasing capacity.

To MoH, other ministries and partners:

- Educate women/caregivers about IYCF with a big emphasis on follow-up to check that the knowledge is translated into behavior changes
- Support vulnerable population in the availability and accessibility of key food items required for proper child nutrition, by reinforcing and improving household purchasing capacity and improving agricultural production
- Increase the nutritional content of food items consumed, through nutrition education and increased accessibility of nutrient-rich food, especially, protein- and iron-rich food, by providing families with small livestock (poultry, rabbits, etc)
- Use national media , especially radio (national, community radio stations) to educate the population in Nutrition, WASH and health services
- Work on the design of standard messages to spread out within the population (have specific themes with clear messages from the central to the community level) across the country
- BCC among health service providers about Nutrition, WASH and health service utilization

At decentralized level:

- Motivate CHC members to be active in the community: Refine the CHC job description and monitoring system
- Increase the awareness and demand of households to install a hand-washing station near the toilet and use soap and clean water
- Use Umuganda to spread out the appropriate information about all health related matters (CHWs, local leaders): Nutrition, WASH and health services

- Motivate pregnant women to access antenatal-care services before the fourth month of pregnancy and strengthen the mobilization of male involvement

Appended below is a summary table highlighting key observed result and recommended action to addressing the gaps.

Key finding	Recommendation
Socioeconomic status	
• **Nearly half of the households (49.6%) in the *Gikuriro* intervention belong to Ubudehe categories 1 and 2, particularly in Nyabihu (63%) and Ngoma (64%).**	➢ Efforts to improve child-nutrition status should be concentrated in Nyabihu and Ngoma, as the majority of their populations live in poor households.
• **Most households (69.2%) experienced stress due to lack of food or money to buy food in the 30 days preceding the survey. The most common coping strategy was "relying on less-preferred and less-expensive foods" (83.9%), followed by "reducing the number of meals eaten in a day" (69.1%), which was done two or more times a week.** • **Nyabihu had the largest proportion of households (47%) with high coping strategies index scores. This means they tend to rely on several different coping strategies several times a week.**	➢ Reducing the number of meals eaten in a day may negatively affect nutrition status. We recommend taking actions to improve household income, which will improve food security in poor households. Special attention should be paid to Nyabihu, where many households had to use several different coping strategies several times a week.
• **31% of households had kitchen gardens**	➢ Reinforcement of kitchen-garden policy and close follow-up of kitchen-garden use and maintenance
Household access to a diverse and high-quality diet	
• **46% of women had low dietary diversity (≤3 food groups), 37% had medium diversity (4 or 5 food groups), and 17% had high diversity (≥6 food groups).** • **60%of households had poor food consumption (severely food insecure), 18%had borderline food consumption (moderately food insecure), and 22%had acceptable food consumption (food secure). The rate of poor food consumption was highest in Nyabihu (69%).**	➢ Food security is a key element for good nutrition status. We recommend more education on food consumption/food items/balanced diet, etc. In particular, we recommend that the project implementers increase income-generating activities and emphasize the proper use of harvested products because the sale of agricultural produce is the main source of income for many households.
Infant and young child nutrition	

• **The awareness of mothers/caregivers about feeding infants (0–6months) was low (46.8%) in all six districts. 12% of mothers/caregivers did not know the appropriate length of exclusive breastfeeding, and only 45.2% were aware of appropriate complementary feeding practices.**	➢ Use diverse means to educate women and other caregivers about infant and young child feeding, and emphasize follow-up to check if the knowledge is translated into attitude and behavior changes. ➢ There is a need of a concerted effort at all levels of the health system in Rwanda, from the community level to health facilities to Sensitize and alleviate some misleading information such as not breastfeeding her baby while she pregnant.
• **Only 6% of children aged 6–23 months met the requirements for a minimum acceptable diet. Only one in three (29%) children aged 6–23 months met the minimum dietary diversity. Only 9% of children aged 9–23 months received the minimum meal frequency (three or more times a day).**	➢ Educate the population on better child nutrition. Encourage a higher diversity of food items consumed and a higher frequency of meals. Ensure availability and accessibility of key food items required for proper child nutrition, by reinforcing and improving household purchasing capacity or improving agricultural production.
• **Consumption of protein-rich food is very low (10.2%–25.3%), indicating that the nutritional value of the food consumed is poor.**	➢ Increase the nutritional content of food items consumed, through nutrition education and increasing accessibility of nutrient-rich food, particularly protein- and iron-rich foods, by providing small livestock such as poultry and rabbits to families.
WASH activities	
• **Only 831 (33%) respondents were aware of the existence CHCs, and only 116 (14%) had participated in dialogue sessions at a CHC.**	➢ Motivate CHC members to be more active in the community. Refine the CHC job description and monitoring system.
• **Only 1.8% of caregivers washed their hands before preparing food, and only 0.8% washed their hands after handling children's feces or cleaning children's bottoms. Only 127 (6.2%) respondents washed their hands before eating, and 21 (1%) respondents washed their hands before feeding or breastfeeding their children.**	➢ Education on when hand washing is required, and a WASH-monitoring system to motivate the adoption of good hygiene practices.
• **333 (13.2%) children aged under 3 years defecated anywhere on the ground.** • **Stools of 90% of children aged under 3 years were safely disposed, which means that the children used a toilet/latrine or their feces were put/rinsed in a toilet/latrine or buried.**	➢ Reinforce the good habit of safely disposing children's feces.
• **Of 2054 households, 518 (25.2%) had a place for hand washing within 5 m from the toilet, while 336 (16%) had soap and water at a hand-washing station commonly used by family members.**	➢ Support households to install hand-washing places near the toilet, and provide them with soap and clean water. Educate people about appropriate hand-washing times and the importance of washing hands at each time.

	Increase household capacity to get water and soap.
• **52% of households had an improved, unshared sanitation facility.**	➢ Support the ownership of toilets.
• **1401 (56%) households properly treated drinking water.** • **1494 (59%) households properly stored drinking water.**	➢ Educate people on water treatment and its importance.
Morbidity and health-services utilization	
• **One in five (22%) children had had diarrhea in the 2 weeks preceding the survey.** • **50% of children with diarrhea received oral rehydration solution, and 7.5% received a government-recommended home fluid.**	➢ Interventions to prevent diarrhea, i.e., provision of safe drinking water, use of improved sanitation facilitations, and hand washing with soap and water.
• **43.5% of respondents had received nutrition education and attended a counseling program in the village, and 27.4% had attended a session in the month preceding the survey.**	➢ Motivate the community to attend nutritional-education sessions.
• **1344 (86%) children aged under 5 years had received vitamin A, and 1277 (81%) had received deworming tablets in the 6 months preceding the survey. Only 6% of children had received micronutrient powder.**	➢ Increase the distribution of micronutrient powder among children aged under 5 years. Caregivers should be educated on and supported in nutrition supplementation.
• **127 (8%) children aged under 5 years had never received any vaccination.**	➢ Even though vaccination coverage is good, more education must be provided to increase coverage to >90%.
• **44.1% of mothers had attended four or more antenatal consultations during their last pregnancy.** • **80 (34.3%) women had made their first antenatal visit before the fourth month of pregnancy.** • **761 (78.7%) women attended at least three antenatal visits with their husbands.**	➢ Increase education on antenatal care and its importance.

9 REFERENCES

1. The Fourth Rwanda Integrated Household Living Conditions – 2013/14 (EICV4).

2. National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda] and II. Rwanda Demographic and Health Survey 2014-15. Rockville, Maryland, USA; 2015.

3. World Health Organisation. WHO child growth standards and the identification of severe acute malnutrition in infants and children. A joint statement by the World Health Organization and the United Nations Children's.

4. UNICEF, WHO, World Bank Group, Levels and trends in child malnutrition,2016 (https://data.unicef.org/wp-content/uploads/2016/09/UNICEF-Joint-Malnutrition-brochure.pdf. accessed on 25/ october 2016).

5. World Health Organisation, Global Database on Child Growth and Malnutrition, . 1997, : Geneva.(http://www.who.int/nutrition/databases/childgrowth/en/accessed on 20 october 2016).

6. Özaltin E, Hill K, Subramanian SV. Association of maternal stature with offspring mortality, underweight, and stunting in low- to middle-income countries. JAMA. 2010;303(15):1507–16. doi:10.1001/jama.2010.450.

7. Prendergast AJ, Rukobo S, Chasekwa B, Mutasa K, Ntozini R, Mbuya MNN et al. Stunting is characterized by chronic inflammation in Zimbabwean infants. PLoS One. 2014;9(2):e86928. doi:10.1371/ journal.pone.0086928.

8. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al.; the Maternal and Child Nutrition Study Group. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet 2013;371:243–60. doi:10.1016/S0140.

9. Government of Rwanda, "Economic Development and Poverty Reduction Strategy, 2008-2012", Ministry of Finance and Economic Planning, Kigali, September 2007.

10. Victora, Cesar G., et al. "Maternal and child undernutrition: consequences for adult health and human capital." The lancet 371.9609 (2008): 340-357.

11. Ramachandran N. Improving Nutrition Status: Lessons from International Experience. In: Persisting Undernutrition in India: Causes, Consequences and Possible Solutions [Internet]. New Delhi: Springer India; 2014. p. 215--228. Available from: http://dx.doi.org/10.1007/978-81-322-1832-6_12

12. WC. G. Food insecure household coping strategies: The case of a low income neighborhood in South Africa. Mediterr J Soc Sci. 5;(5(13):100.).

13. NISR M. Comprehensive food security and vulnerability analysis. J Chem Inf Model. 2016;53(9):1689–99.

14. Guidelines for measuring household and individual dietary diversity.

15. Unicef. Improving child nutrition. The achievable imperative for global progress. 2013. 1-132 p.

16. Bhutta Z a., Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E, et al. What works? Interventions for maternal and child undernutrition and survival. Lancet. 2008;371:417–40.

17. WHO. Indicators for assessing infant and young child feeding practices: Part 3 Country Profiles. 2010;1–47.

18. Unicef. Indicators for assessing infant and young child feeding practices. 2010;1–52.

19. Ali Naser, Ihab, et al. "Association between household food insecurity and nutritional outcomes among children in Northeastern of Peninsular Malaysia." Nutrition research and practice 8.3 (2014): 304-311.

20. Rwanda Governance Board website: http://www.rgb.rw/governance-innovations/ubudehe/.

21. Rwanda vision 2020.

22. Black, Robert E., et al. "Maternal and child undernutrition: global and regional exposures and health consequences." The lancet 371.9608 (2008): 243-260.

23. WHO.Indicators for assessing infant and young child feeding practices : Conclusions of a consensus meeting held 6–8 November 2007 in Washington D.C., USA. 2008.

24. Howard G, Bogh C, Prüss A, Goldstein G. Healthy Villages A guide for communities and community health workers. 2002.

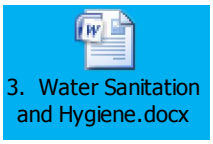
25. Third Health Sector Strategic Plan 2014-2018.

10 APPENDICES

Appendix 1: Socioeconomic and Demographic Characteristics and Food Security

Appendix 2:Infant and Young Child Feeding

Appendix 3: Water, Sanitation, and Hygiene



Appendix 4: Morbidity and Health-Services Utilization